



e frequently surprise people with inventive, imaginative software, and people frequently surprise us with the way they use it.

For example, you'll read on this page about how a California soaring club uses our Reflex: The Analyst" to give their pilots weather and thermal predictions and

charts and graphs every weekend.

That's an application we didn't imagine when we released Reflex as a highly visual analytical database manager and report writer.

But it's the kind of eye-opening application that might stimulate fresh ideas in your mind about how you can put your Reflex: The Analyst to work for you.

And thank you for your interest in and support for Borland International.

Philippe Kahn, President, Borland International

INSIDE STORIESI

☐ Maybe no one but your mother knows you can't spelt, but go on-line with CompuServe, MD. The Source and others, and the whole world knows! So use Turbo Lightning to save you from public elections, embarrassment, Lightning checks, your spelling on-line, as you type, and before the went' gets out. See inside pages

☐ Just released, new addition to Turbo Lightning, Called the Lightning World Wizzad, it's both a technical reference manual for the "engine" that drives flusho Lightning, and a crossword-oxiving, mind-bending, mystery-making, code-cracking set of world challenges—and you don't need to be a programmer to glay.

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Reflex: The Analyst and the Wild Blue Yonder!

Andrew J. Piziali wrote us, "I have been using Reflex for several months now for both home budgeting and, would you believe, SOARING PORRCASTS!

This searing forcess is uploaded to the local hang gliding bulletin board each Saturday and Sunday morning. Prior to using Reflex, the rear data was plotted on a weather chart with a plastic overlay. This (new) system is much easier to use and I can manipulste the graph soales and typothesites souring conditions under changing variables."

He sent us Reflex graphs showing "Thermal Index va. Altitude" and "Temperature vs. Altitude" (both shown here), along with Reflexgenerated reports showing inversions, wind direction, knot speeds at varying altitudes, and top of convection stata. All the



criteria pilots need to know and need to see before they fly, because most of them know the flying maxim, "There are old pilots and bold pilots, but there are no old bold pilots."

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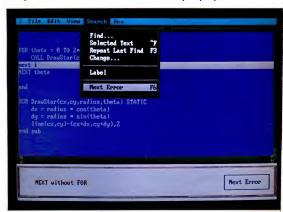
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Gerard Kunkel

HAT'S INSIDE



As the longest running and most widely read personal computer columnist. John C. Dvorak has always been the consummate insider. With this issue, Dvorak joins the most respected lineup of columnists in the business: Bill Machrone, Peter Norton, Stewart Alsop, Jim Seymour, and Stephen Ma-

nes. Like the legendary Yankees lineup of the twenties, this collection of heavy-hitting opinion-makers is a real murderers' row. Starting on page 89 in this issue and continuing in every issue

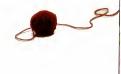
thereafter. Dvorak-best known for his popular Inside Track that is required reading for industry movers and shakers-combines his trademark predictions, opinions, gossip, and exposés with insightful commentaries on the industry's central issues and controversies. We've been John Dvorak fans for years, and we're sure you'll he as well.

Every month we receive hundreds of new-product announcements, all clamoring for your attention and your dollars. What readers tell us they want, though, are quick, accurate first looks. Since the arrival of senior editor Bill Howard last year, the focus of PC News has increasingly reflected this need. PC News has been updated (and enlarged) so that it is now the timeliest source of reliable hands-on product evaluations anywhere-a useful complement to the PC Magazine Labs comparative reviews in the middle of the magazine. And, as you can see for yourself on page 33, PC News even has a new design and a new name: First Looks. This issue's First Looks include hands-on reviews of a \$507 PC compatible, a switch that can speed up your PC's microprocessor to 12.5 MHz, and an analysis package that presents an alternative to spreadsheets.

"Am I glad I didn't get into that EGA market!" says Kevin Jenkins, president of Hercules Computer Technology, the company that makes the popular Hercules monochrome graphics card. Who can blame him? It's a jungle out there: the market for enhanced graphics adapters has become increasingly crowded in the past few months, with new boards announced every week and prices plummeting rapidly. Before contributing editor Charles Petzold even finished testing the dozen EGAs reviewed in this issue (page 145), he was planning reviews of the next batch for a followup article. (Two EGA boards that arrived too late to make the Features Department deadline are reviewed in this issue's First Looks section)

After torture testing the EGAs, Petzold went a step further and wrote a set of powerful, practical EGA utilities-the first we've seen. The first half are in the Programming/Utilities column on page 367; more will follow in the next issue of PC Magazine.

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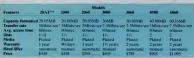
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LETTERS TO PC MAGAZINE



ENTHUSIASM ABOUT SHAREWARE

I read your great article "Shareware: Nominal Fees Can Yield Big Value" (PC Magazine, Volume 5 Number 9) with enthusiasm. However, I would like to add a

few points about shareware. As a sysop of the Wargames RBBS, I



bundled Smartcom.

feel that public-domain software has exceeded the quality of much commercially available software. For example, according to a recent survey that we conducted.

about 70 percent of the users of our bulletin board use Qmodem, the shareware communications package reviewed in PC Magazine. Significantly, many users switched to Qmodem from commercial programs such as Crosstalk and Haves's

Shareware also provides users with more-frequent updates and newer versions than commercial packages because the authors distribute them through bulletin boards. And, since authors don't pay for marketing, they keep more of the profits.

Because of the frequency of the updates, PC Magazine's listing of major software contains many outdated version numbers. There were two other errors in the article: the file extension for ARC should be .EXE, not .COM, and Omodem can store up to 200 numbers, not 100. Shareware is certainly the best way to

market great software, and it can be more profitable than commercial packages. It should be encouraged. Jason I in

Santa Monica, California

COPY PROTECTION BLUES Bravo! PC News ("Copy Protection Los-

ing Its Favor," PC Magazine, Volume 5 Number 10) accurately and bravely condemned copy protection schemes, revealing how they create nothing but trouble for software users and publishers alike.

I believe that most people who copy software for private use either cannot or will not pay the asking price. In either case, the thieves are not likely to be potential customers of the illegally copied software. Their attitude is that if they can't steal it, they'll do without it.

The unconscionable offenses of those who steal, rather than work, for their profits, whether bootleggers or businesses who knowingly allow employees to violate license agreements, should be punished by the courts. These determined cheats cannot be stopped by any reasonable copy protection scheme; the cheaters are as clever as the protectors.

So why let the unprincipled pirates jeopardize the smooth and efficient use of computer software for the rest of us? As purchasers, licensees, sublicensees, or end users, we have the right to unobstructed access to our software and should be able to protect our investments with backup copies. Yet, as valued customers, we are persona non grata to a few arrogant software publishers foolish enough to believe that they can do without us.

Phillip Cripps Van Nuys, California

REPAIRS As a PC technician I want to add a few ob-

servations to your article "The Repairs Game" (PC Magazine, Volume 5 Number 8).

Customers, don't expect your techni-

cian to be perfect. With the computer field changing so rapidly, your technician is trying his hardest to keep on top of changes. Put yourself in your tech's shoes for a minute or two. All they see and hear are dead machines and customers ranting and raving about their problems. If a technician



extra for you, spread the good word with a letter or a nice follow-up call. You might just save a good technician from humour

You could also learn a little more about your hardware. Try to help diagnose the problem in-

stead of just saying, "My PC won't boot." Remember, we are all in the computer age together and should, therefore, cooperate. Ed Weissman Hopolulu, Hawaii

3278 EMILIATORS

I would like to clarify some points about Attachmate's 3-N-1 3270 Coax Adapter reviewed in Charles Petzold's article "A Window on the 3278 World" (PC Maga-

zine, Volume 5 Number 9). Although Mr. Petzold stated otherwise.

file transfer was functioning correctly; the 3-N-1 receives data exactly as transmitted from the host. If other products remove portions of the data file, there's room for concern. In any case, we suggest hostbased file transfer over the TSO EDIT transfer that was tested. Mr. Petzold missed the significance of

our PC-DOS window. Instead of hot-key, we allow concurrent operation of a PC application and four host sessions. These



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■ LETTERS

functions, along with IRMA and IBM hardware compatibility, have proven extremely stable. The minor problems he did encounter (even the buzzer) were corrected in our February release.

Michael A. New Attachmate Corp. Bellevue, Washington

Charles Petzold replies:

I am glad to hear that Attachmate hus fixed some of the problems I encountered in its 3.N-1. As I said in my review. There is much to admire in this package," but when I discovered that the PC-DOS window disabled some normal DOS function keys and disnorted the workings of DOS in

other wors, my enthasisan planmeted. In my tests of the 3278 remlation boards, I downloaded and uploaded the some files with all the packages that included EDIT-based file transfer software. Only Attachmate's downloading included the EDIT line numbers in the resultant PC file. Although I did not say so in my review, my notes also show that the uploading logmy notes also show that the uploading log-

ic failed to cut EDIT on completion.

I definitely supported in history deprivation for a first manifer software is preferable to first manifer software is preferable to first manifer software in many environments, the EDIT-based file-transfer programs will have to suffice. Gening host-supported software installed on the mainframe may be a supported to the mainframe may be a supported to the programs will be a supported to the programs and the professional visions. There is suit significant resistance to PCs in general among DP managers, and data processing backlogs (dimitistr to onyone who has worked in such as corporate centrological) may relt as what corporate centrological may rel-

Therefore, EDIT-based transfer software is probably used more frequently on 3278 emulation products than any of us would care to think. For this reason, I gave high marks to products that conquered the difficulties inherent in developing EDIT-based transfer software.

MUSICAL SOFTWARE

I'm somewhat puzzled by the article "Music: The PC's New Frontier," which appeared in PC Magazine, Volume 5 Number 8. Although the article was well written and contained a lot of information about MIDI software and beginning it did not cover all the available products. In particular, Texture, Version 2.0, was not reviewed although the author of the article, James Langdell, quoted Roger Powell, the

author of the program.

Texture is one of the most powerful software products of its kind. It has gained a following among many users, including such names as Bob James (composer of the Taxt theme) and John Kay (of the rock and roll group Steppenwolf). Not only that, product support of Texture is uncommonly good.

■ How can you have a

real Editor's Choice if you don't have the top players on the team?

How can you have a real Editor's Choice if you don't have the top players on your team or if you choose to keep 'em benched? I strongly feel that Roger Powell and Texture should be given equal time.

Sheldon M. Smith Rochester, New York

PC Magazine was owner of Texture, Version 2.0. at the ine the article was published. However, during the editorial excite Roper Powell told James Langdell that the company marketing the product, Cherry Lame Publishing, was closing down its entire Cherry Lame Technologies division to Powell further explained that he was not company, which would release a versied version of Texture. Berease its availability was uncertained that the was not correction with that time, the product was not certain with that time, the product was not from Music Soft, P. O. Bax 72-8. Berkman, NY 12570-(1942-24688.—Ed.

SETTING THE ACCOUNT STRAIGHT

In PC Update's report (PC News, PC Magazine, Volume 5 Number 9) on Great Plains Software's newest release of the Great Plains Accounting Series, it was stated that Great Plains incorporated Soft-Craft's Burieve and Burieve/N file-manage-

ment programs into its new releases. This is correct. However, the article also said that Brrieve and BrrievelN are public-domain software programs; this is not true. There are no run-time royalties for Brrieve-based products, but Brrieve itself is not free, public-domain software.

Also, Great Plains Software is located in Fargo, North Dakota, not Austin, Texas. And Btrieve and Btrieve/N—not the Great Plains accounting packages—are priced at \$245 and \$595, respectively.

Tom Reinertson SoftCraft Inc. Austin, Texas

CORRECTIONS

The Fact File for Menu Manager from Phoenix Systems in PC Lab Notes (PC Magazine, Volume 5 Number 6) listed the wrong company address. The address should read 668 57th Street, Sacramento, CA 95819. In addition, the correct price is 575. not \$150.

In the features table for the article "IBM Luptop Dignifies the DOS-to-Go Market" in PC News (PC Magazine, Volume 5 Number 10), we listed the Morrow Pivot II as having two 3½-inch drives. The machine really has 5½-inch drives.

The article "Shareware: Nominal Fees Can Yield Big Value" (PC Magazine, Volume 5 Number 9) listed an out-of-date address for FAB Software. Newkey, Version 3.0, may be obtained for \$24.95 plus \$2.50 postage from FAB Software, P.O. Box 336, Wayland, MAO1778.

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thing about speeding up the microprocessor (or CPU) speed. As you know the microprocessor is the brain of the computer that controls all the operations like screen updates and calcu-lations like a spreadsheet makes.

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We wanted to offer a speedup card that would be the compliment to our disk speedup software, (incidentally in-cluded at no extra charge.) We wanted it to be literally the most advanced, fastest, most feature rich board available today. We could only be satisfied with a board that was the finest example of the engineering art.

There is no question we have met our every objective by developing and manufacturing the BREAKTHRU 286 card. This is the best designed and most functional speed up card available today. We guarantee it. HERE IS WHAT MAKES IT SO SPECIAL.

First, it installs so easily. It is a half slot card, only five inches in length. You don't even have to give up a full slot. What's more, unlike competing products it works in the Compaq and most clones. The instructions are so simple we considered showing a picture of a child putting it in. Easy diagrams show how you just place the card in an open slot, remove the original processor and connect a single cable. There is no software required. From that moment you are running faster than an AT

Second, it is advanced. The BREAKTHRU 286 replaces the CPU of the PC or XT with an 80286 microprocessor that

is faster than the one found in the AT. A 16K cache memor provides zero-wait-access to the most recently used code and data. In benchmark tests the card accelerated software programs—both custom and off-the-shelf anywhere from 200% to as much as 700%. Wow!

Third, you have full compatibility. All existing system RAM, hardware, and peripheral cards can be used without software modification. It operates with LAN and mainframe communication products and conforms to the Lotus/Intel/ Microsoft Expanded Memory Specification (EMS). Software

compatibility is virtually universal

Fourth, it is the best there is. There are several other boards on the market. Some are priced about the same as the BREAKTHRU 286 and some are cheaper. We at PCSG have BREAKTHRU 286 and some airc cheaper. We at PCSC have compared them all but there simply was no comparison. We compared them all but there simply was no comparison. We are compared to the simply was not compared to the simply we simply as a ranginal speed up in spite of their claims. We found some to be inverty versions of the obsolete BSS or 8006, and others to be inverty versions of the obsolete BSS or 8006, and others to be inverty versions of the obsolete BSS or 8006, and others to be inverty versions of the obsolete BSS or 8006, and others to be inverty below the simply as the size of the size o

Write ROM that reviewers rated as excellent. We were pro-to successfully enter the IBM PC market last year with disk access speedup software. Now we are so pleased with the BREAKTHRU speedup card. We use them on our own PC's to make them faster than AT's. We are really excited about

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Decomposed low level function the high-level calls are supplied. All machine dependency is housed in inter changable overlags loaded at run-time Thus no recompulation needed to run on a mix of PC and MS-DOS machines. C Worthy bands you a consistent and infutive interface and a revolutionary desem approach. Novel found a played a key role and accelerated developmen

CATREE B-Tree File Manager, Source Code, No Royalties!

C tree is study code from nan weathered many seasons of prosource, so you can modify a to fit a special case No royaltes provided you bind it into your binary application Otree's design splits nodes to allow any number of users to access an index file simuljaneously even when updates are in progress So multiuser configurations and adaptation to networks are possible Record-locking routines are provided for

DOS 31/32, UNIX and XENIX Thanks to source code which does not deviate from the K&R standard. Oftee can trave) Texts in many environments prove that C tree gives your application a ticket tree permits any number of keys for a data file, supports duplicate keys alphanumenc or numeric, supports files of variable record length, multiple keys in one index file, and keys of variable length. Both high level ISAM soutnes which handle denails with minimum coding and decomposed step by step functions you can access

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DAN BRICKLIN'S DEMO PROGRAM Storyboard Your Program

The Legendary One has created Mesaphor Two when the rest of us are vail on Zero. Dan's first was the original electronic spreadsheet (VisiCalc¹⁶). This one is for programmers

Words don't express program ideas ecause programs are screens! Dan's Demo creates sixte shows Create a screen — a snapshot of your planned pro-duct as it runs. Arrything goes, words, borders, box rules, inverse and underlining of monochrome, fore- and background color Copy this "sixtle" to an empty screen Change it a little to show the next instant of run ume Do s again Presto, a whole slide show of your program in action All 250 characters and attributes an All 250 characters and annuales are available from scrollable lists which pop to the screen. All commands are layered in Lotus-style pop-up menus. Frequent

80x25 character mode, not be mapped seen areas can be blocked for cut and paste or filled with color or characters even blink Stides can overlay on others, can be shuffled, deleted Stides can pro-

coed at type intervals or branch anywhere in the side sequence depending on user Invaluable to prototype the program you are about to write, to position the labels hoose the color decor, smoothe out the keystroke interface Ot load the 'Capture utury and snapshot the screens of any run rang program for an instant side show ch copy entries you to redustribute fifty of the slide projector program that rurs demos. Plain marrial, no burides keeps pnce of big product small "Might

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F or a trifling price, BASTOC™ moves truckloads of BASIC code over to C. it's a translator which takes in Microsof Extended BASIC and emits pure K&R C for Latine 30 It will optionally convert your program uno a single monolithic C function of decompose it into separate functions, one for each OOSUB label Version 2's optimization dramatically version 23 optimization dramatically reduces execution time. Converts to in-tegers those variables in BASIC programs which do not need floating point. Where BASIC uses full assignment statements to increment counters, BASTOC converts to C's compact form. Strings dynamically allocated inciding your application of BASIC's cutationic halts for garbage collection Creates structure of even convoluted

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GSS GRAPHICS SYSTEM Leave the Device Driving to GSS ANSI CGI STANDARD

G SST has reconfigured two compo-ness of as comprehensive graphus tools to conform with the ANSI Computer Graphus Interface (CGI) standard. At the heart of the system is the Develop-ment Tholkin which corrects all learnance. ment Tholics which contains all language merfaces and device drivers for law boards, mice, iointicks, tablets, print plotters, cameras, and more Drivers house management of vector graphics (plotters) and bitmaps used by raster input devices (scarners) to insulate the application program from concern for device identynctacy No one else has implemented CGI that way it means your naveramment remains

generic, just switch drivers and the same program will drive a different device.

GSS KernelTM conforms to level 2b of
ANSI's Graphical Kernel System (GKS) and contains all its needed drivers and language bindings. Kernel has macro level tools to draw and color an object, store the sequential instructions, and recrease the object on its own, as well as segment it transform it, etc. So powerful, a single com mand may represent several score lower vel statements. Plotting has the equivalent GKS tools for aph and chart generation and their cap tioning hand it apples and oranges, say per, and a bakes the numbers into a per, and it bases the numbers and a dispessible display for screen or plotters. Kernel and Plotting have tools to convex images they create to ANSI Computer Graphics Metallies (CGMs), a toleraged

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Major Upgrades to the Best Selling C Compiler Lettice now delivers smaller EXE files, boasts very fast link times and a more effi-

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PC ADVISOR



Help for readers in making the right choices when speeding up a PC with a turbo card, in getting word counts on text files, and in shopping for a hard disk.

A FASTER

At the moment I do not need one of the new accelerator/turbo cards for the "slow" IBM PC, but I know that I will someday. I do plan to buy a memory expansion card soon, and I want to know whether I should buy a "regular" PC memory card or one for the AT, with its faster memory chips?

Gary Williams

St. Augustine, Trinidad and Tobago

Don't buy un AT card for your PC-it won't work. But you raise an interesting point. If an accelerator board uses an 80286 chip or changes the clock speed to get a PC or XT running at AT-level speeds. why not take full advantage of the higher processing speed with faster RAM chins? The drawback is the slower ratings of the RAM chips already in your PC or XT. You can have only one memory-uccess speed, so the slowest chip in the system becomes the standard. Some turbo cards add wait states to slow down RAM accesses to the PC's 200- to 250-nanosecond RAM range. The Overthruster (Nuclear Technologies. Fountain Valley, Calif.; (714) 841-3336; \$195 with a V20 chip) and the Fast88 (MicroSpeed, Fremont, Calif.; (415) 490-1403; \$149, \$169 with a V20) have jumper settings so you can set the clock cycle to the fastest speed the RAM chips will allow.

This limitation is completely overcome by the PCturbo286e (Orchid Technoiogies, Fremon, Calff.; (415) 490-8886; \$1,195), the PC-elevATor (Applied Reasoning, Cambridge, Mass.; (617) 492-0700; \$1,195), and other boards that replace all the PC's RAM (up to 1 or 2 megabytes) with fast (120- to 150-nano-second) chips. That's the best way to achieve the kind of speed you're looking for. Using faster RAMs can increase the machine's overall speed by 10 to 15 percent, beyond the improvement from the turbo curl.

COUNTING WORDS

Unaccountably, my WordStar 2000, so excellent in other respects, won't count words. Surely there must be a generic program somewhere that will count words in, say, ASCII files. I am very much a novice, have essentially zero programming skills, and have no access to bulletin boards.

James Morrison Encinitas, California

Word counts are one of the fringe benefit you get with in many spelling-checker programs. Webster's New World Spelling-Checker (Compared Sphware) Division Sphware Division Sphware Division Sphware Division Sphware Division New York, N.Y.; (212) 2426-4400; 589-59; and The Randle House Proofteeder (Digital Marketing Copp., Wathart Creek, Calif., 1860) 826-679. Wathart Creek, Calif., 1860 326-679. Wathart Creek, Ca

DOUBTING IBM

My wife and I own an IBM PC and have decided to install a hard drive. The article "Courting Disaster: The IBM PC AT" in the April 29 issue of PC Magazine (Volume 5 Number 8) has caused us to question

the reliability of all IBM internal hard drives. Please clear up any misconceptions we might have and cnlighten us with the names of generic hard disk drives that would be compatible.

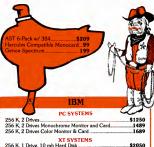
Dennis L. Edge Pearland, Texas

The crashes pluguing AT hard disks have no correlation with PCs, XTs, or any other IBM product. The problems almost certainly stem from the particular combination of disk drive and disk drive controller used in the AT. It would be a mistuke to avoid other IBM products because of this isolated problem with CMI's AT hard disks. On the other hand, it would be foolish to overlook the wide range of internal hard drives sold through muil-order houses; they'll prove to be just as reliable at a much more congenial price. Tandon, Shuvart, and Priam are among the makers of dependable, economical internal hard drives. For easier justallation (at a higher cost), consider hard disk cards from Mountain Computer, Western Digital, or Plus Development. The best way to shop: call several mail-order houses or visit nearby retailers, explain exactly how your system is configured, and see what they recommend. Make sure they offer the level of technical support you think you'll need. Then order the product you feel most comfortable with.

ASK THE ADVISOR

Send your questions to The PC Advisor, PC Magazine, One Park Avenue, New York, NY 10016.

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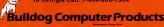
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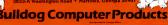
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FIRST LOOKS

Under-\$600 PCs: Worth the Price?

PC HANDS ON

THE PC+ offers a surprisingly sturdy one-drive system unit for \$507

BY JOE DESPOSITO

You can buy an IBM PC for just under \$2,000, well-known compatibles such as Tandy and Epson for \$1,000, and, if you're

willing to go with a lesser- ! known brand, a dozen or more personal computers are available for \$500 to \$600 for the basic system unit with one disk

To see how budget PC compatibles stack up on reliability and performance, PC Magazine Labs took a look at one of the least expensive units, the new \$507 THE PC+ from Thompson, Harriman & Edwards Computer Products Co. (THE). an affiliate of the Chicago-

based PC Network mail-order house. The THE PC+ is advertised at \$469 for the system unit with 640K bytes of on-board memory, keyboard, and one 360K-byte floppy disk drive and controller, but since there's an 8 percent markup for anyone other than dealers, the price comes to \$506.52.

A single floppy disk drive unit with a monochrome/graphics monitor would be \$672-not much more than IBM's or-

(continued on next nove)

While Plus isn't the first at 20

HANDS-DN INDEX

Well-built, affordable \$507 PC-compatible system

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Plus Shoehorns 20 Mbytes Onto a Single-Slot Hardcard

HANDS ON

BY CHARLES BERMANT Plus Development Corp., which shipped the first 10-mesion card in October 1985, has 1 enhanced the Hardcard with a 20-megabyte version, the \$895 Plus Hardcard 20.

The Plus Hardcard quickly generated a field of imitators, gabyte hard disk on an expan- 27 at last count. Plus savs.

megabytes, it may be the best. Compared with the competition, the new Plus Development drive is generally faster, thinner, less power-hungry, better (continued on next page)

Below, a light source, deflected by a front-surface mirror, shines through a scored slide to a photo detector to provide the track reference points







to \$895 Plus Hardward 20 is the smallest and fastest 20-megabate hard disk ward on the market. Its 43-milisecond access time puts the speed of an AT hard disk in a PC or XT.

THE PC+

phaned PCjr-or \$753 with two

(continued from preceding page) drives

Added to the basic system that we tested was an EGA display board and a Seagate 20megabyte hard disk.

Speeds: 4,77 and 8 MHz The THE PC+ runs at either

the usual 4.77-MHz clock sneed of the IBM PC and PC-XT or at on increased speed of 8 MHz (keyboard selectable with Ctrl-Alt-Minus), At 8 MHz, the THE PC+ ran some PC Labs benchmark tests as much as 40 percent faster than the IBM PC. However, the benchmark test for floppy-disk speed would not run when the system was in the 8-MHz mode. Also, normal operations such as formatting a floppy disk would not work at 8 MHz.

Otherwise, the THE PC+ performed without a mishap. We ran 1-2-3, XyWrite, and other software and noticed no compatibility problems.

The system unit is solidly built, with a steel cover and chassis, a 135-watt power supply, eight expansion slots (like the XT), and five ROM sockets (like the PC)-only one of which is populated. Many of the chips are socketed rather than

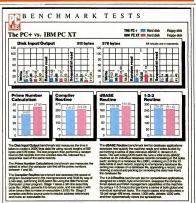
The keyboard layout resembles the original IBM AT keyboard. The keys have a light resistance to the touch, but it's fine for typing.

soldered in

Options Already Installed

The THE PC+ units ordered through PC Network come with options, such as video display cards and hard disks already installed, according to THE's president, Steven Dukker, That's not the case with all budeet PCs. Additional benefits are a 45-day money-back guarantee and 1-year warranty, plus customer and technical support

There is always an element of risk involved when you shop for the lowest-priced product, but in this case there appears to be enough of a safety net with a guarantee and warranty to make the risk worth taking.



At 8 MHz, the \$507 THE PC+ runs substantially faster than a stock IBM PC, but some tasks only work at 4,77 MHz. The PC+ System uses Quine floppy disk drives and the ubiquitous Seugate ST-225 hard disk. (\$416).



THE PC+ PC Network 319 W. Ontera St. Chicago, tl. 60610 (312) 280-0002 List Price: With 640K RAM. one floppy disk drive, \$507; with Amber+ monitor, mono graphics card, \$672; second 360K floppy disk drive, \$81; 20-Mbyte hard disk, controller \$416: EGA card, \$259. In Short: The THE PC+ is well

built and has enough company support behind it to make it a very attractive alternative to higher-priced competition CIRCLE 423 ON READER SERVICE CAR

integrated, sturdier, and only modestly more expensive.

The Hardcard 20 is the same width (1 inch) as its year-old sibling and fits into one expansion slot, while competitors are as much as 11/4 inches wide and take up two or one and a half slots (a half-card can go into an adjacent slot). It uses just one printed circuit board, and the dual-platter, four-head Matsushita-made drive employs a custom-designed spindle motor to save space and power. It draws 8 watts-a 3-watt improvement over the original.

The Hardcards use rotary voice-coil technology for speedy head positioning. Plus Development rates the average access time of the Hardcard 20 at 49 milliseconds: it was benchmark-tested in the PC Magazine Labs at 43 milliseconds using the Core International speed test. That's fast-almost the equal of the PC AT's 40-millisecond drive and twice as fast as stock PC-XTs, which average 85 to 110 milliseconds. In comparison, five of the first hard disk cards tested by PC Labs (see "Hard Disk Cards: An Expensive Solution Worth Considering," PC Magazine, Volume 5 Number 6) ranged from 60 to 159 milliseconds.

Installation

Like the 10-megabyte version, the Hardcard 20 has its installation software on the disk and works with all versions of DOS from 2.0 on.

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Distributor and Model	Cost	RAM (K bytes)	BIOS	Features
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Micro 1 Micro 1 XT	\$499	640	Arc	
System 3 Corporation System 3 XT	\$499	256	Erso	
THE/PC Network PC +	\$507	640	Antex	4.77/8 MHz Intel 8088-1
47th St. Photo	\$549	256	Fountain	

PC Source/CompuAdd \$549 640

\$595 640 Five Ster 4 77 MHz Intel 8088-2 tek Corp. \$595 256 \$596 640

\$1,845 256 Except where noted all machines include system unit with eight ex-sion slots, keyboard, 4.77 MHz, 8088 processor, and one 360K-by floopy disk drive but no monitor or monitor card. Prices are as of Ji

At least a dozen companies, mostly mail order, offer PCs for less than \$600, while brand names are \$1,000 or more. For a working PC, you need to add a monitor, more tor card, and DOS. Street prices of IBM PCs are often lower than listed here.

Plus Development claims the Hardcard 20 can handle up to a 100-G-power-off impact and 10 Gs with the power on. The heads park automatically when the power is off.

One Drawback

The only drawback to the Hardcard 20 stems from the permanent link between drive and controller, so it can't be used in PC ATs with their combined floppy/hard disk controllers. It will, however, work in a harddisk-equipped XT if you want a second Winchester, or two Hardcard 20s can work side by side in a PC. Also, Plus guarantees its Hardcard 20s will work only with the most IBM-compatible machines: the Compaq, the AT&T PC 6300, and the Olivetti PC M24



Plus Hardcard 20 Plus Development Corp. 1778 McCarthy Blvd. Milnitat. CA 95035-7421 (408) 946-3700 List Price: \$895

In Short: Plus Development's russed new 20-Mbyte version. of its Hardcard is the thinnest (1 inch) and fastest (43-millisec-

ond average access time) 20-Mbyte hard disk card yet. For IRM PCs and XTs (not available for ATs) and close come tibles only. Sets the standard for the next generation of hard disk

CIDCLE AND ON DEADED SERVICE CARD

TurboSwitch Lets ATs Reach 8 to 12.5 MHz

HANDS ON

BY WINN L. ROSCH

When IBM found PC AT users were swapping the speed-goveming crystals on their ATs to make them run faster than the factory-specified 6 MHz for as little as \$15 (see "Making Fast Faster," PC Magazine, Volume 4 Number 23, page 136), it

The \$125 AT has three ICs. seven resistors three capacitars, one tronsis tor, and three petiches, It alloser ATe to rom as fast as 12.5

MHz: most will SHEET TO MILE



changed the ROM BIOS to lock the AT in at 6 MHz. But not any

The AT TurboSwitch II offers a way around the restrictions. This \$124.95 aid replaces the standard AT crystal with a variable frequency synthesizer that mimics crystals giving speeds of 8 to 12.5 MHz in half-

megahertz steps, plus 6 MHz. You can change the speed of the computer from outside the case and switch back to a default speed of 6 MHz to install copyprotected software or run speed-

sensitive programs The AT TurboSwitch II includes a reset button to allow cold boots without turning the system off and on, for those times when the system is hung up so badly the Ctrl-Alt-Del warm boot won't work.

12.5 MHz Unlikely In practice, most ATs will not run at the 12.5-MHz limit. You determine the optimum speed by increasing clock speed until the system crashes. The AT used in the PC Magazine Labs test reached 9 MHz, Typically, the AT TurboSwitch II will increase processing speed by about a third.

used cutout in the AT's back panel and looks just as if IBM had designed it in (it makes you wonder why IBM didn't)

into the 80287 numeric coprocessor socket, the crystal

socket (after the crystal is re-

moved), and the power supply.

Two of the connections are

made with clip-leads; if one of

them slips off, the system crash-

es. The unit mounts in an un-

Although no soldering is required, installation cannot be recommended to novices. The terse instructions may baffle anyone who isn't familiar with IC pin numbering and other circuit conventions.



AT TurbeSwitch II Megihertz Corp.

2681 Parleys Way, Bldg. 2-102 Salt Lake City, UT 84109 (801) 485-8857 List Price: \$124.95. Requires: IBM PC AT.

In Short: A frequency synt sizer that affords all PC ATs the ability to run from 8 to 12.5 MHz (in half-megahertz steps), as well as 6 MHz, includes a reset switch for cold boots without powering down. Installation is straightforward but not for nov

CIDCLE ANY ON DEADED SERVICE CADE

Show Partner Mixes **Graphics, Animation**



HANDS ON

BY WINN L. ROSCH

IBM's PC Storyboard changed the world of on-screen presentation graphics with animation, moving and changing screen images under PC control. Now IBM's year-old market-leading presentation animator has formidable competition in Show Partner, a product of the 61/2vear-old PC software company Brightbill-Roberts and Co.

As with PC Storyboard, Show Partner adds life to presentation graphics by generally speeding screen updates and allowing fractional screen parts to be independently changed. It buffers a full graphics screen and quickly switches between images. In addition, Show Partner allows the quick creation of images with a graphics editor and presentations with its unique auto-build feature.

Four Primary Programs The Show Partner package

consists of four primary programs, most with easy-to-use. pull-down menu interfaces; · CAPTURE is a resident

program that allows you to save any image appearing on a PC monitor to a disk file so that it can be edited and incorporated into a presentation.

· SP presents a template for designing presentations. It permits several varieties of transitions from screen to screen to be selected: simple replacement of other, wiping along either screen axis or diagonally, a twoscreen interweave, fading, and nearly smooth scrolling. The effects can be assigned three speeds, and display times for each screen can be set from instantaneous to 90 seconds (or until a key is pressed).

. SHOW is a small (15Kbyte) run-time module that will display the presentation from the commands created with SP. SHOW can be distributed with presentations without royalty. · SPGE is a memory-resi-

one screen (or portion) with an-Color Graphics Adapter, the 1BM Enhanced Graphics Adapter, and the Hercules Graphics Adapter. Most display modes are supported, as well as the highest-resolution multicolor modes. Instead of using senarate drivers, however, the program determines for itself what monitor and color display abilities are available and adjusts itself accordingly.

For hard-copy output, Show Partner will drive any of about 60 printers and the Polaroid Pal-

ette film recorder. Although it still has a few mi-

Show Partner operates with all standard IBM graphics adapters, including IBM's Color Graphics and Enhanced Graphics Adapters, and the Hercules Graphics Adapter.

dent graphics editor (essentially the same as Brightbill-Roberts's well-known GraFIX Partner) that operates like a paint program (such as PC Paintbrush or Dr. Halo) and can change size, alter color, and rotate, move, and draw on any screen image. In addition, a small clip-art library, 20 type fonts, and demonstrations are included.

EGA Supported Show Partner operates with

all standard IBM graphics adapters, including the IBM nor (nonfatal) bugs, Show Partner has a more friendly interface and a more powerful editor and supports a wider range of hard-

ware than the IBM product. Our only competition is IBM's PC Storyboard," says Stephen T. Brightbill, president of Brightbill-Roberts, "We let IBM create the market for us.

As if that were not enough, the success of Show Partner is assured even without retail sales. More than 200,000 copies have been ordered for bundled distribution with vari-



Show Partner, Version 1.2 Brightbill-Roberts and Co. Ltd. 120 E. Washington St., #421 Syracuse, NY 13202

(315) 474-3400 List Price: \$79 until August 31. \$149 afterward; \$30 for GraFIX Partner owners Requires: Show Partner Ani-

mator: 256K RAM: Editor: 100K RAM: Minimum regr ments: 320K RAM with CGA. 640K with EGA, two floppy disk drives or hard disk. In Short: Presentation grad

screen animator with imagecapturing software, memoryresident graphics editor, and royalty-free run-time module that supports a wide variety of hardware. Similar to and more affordable than IBM's \$250 PC Storyboard. This program is not copy protected. CIRCLE 498 ON READER SERVICE CARD

ous hardware products, including the AST ColorGraph Plus display adapter, Thomson monitors, and Kodak's System 10

LCD presentation display. Although Show Partner should find wide applications in presentation graphics, it has far greater capabilities. One hint of its potential is PC Life, an animated, disk-based computer video magazine that features interactive graphics based on Show Partner routines. The system should also prove useful for training and instructional materials where colorful animated action is needed to keep a drowsy audience awake.



Show Partner adds action to graphics. In screens I and 2 images fade into view pixel by pixel.



ment on the standing figure in screens 2 and 3



Show Partner draws text and charts (in 20 fonts) at three speeds and display times.





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Point Five: A New Wav Of Looking at Numbers



HANDS ON

Better than spreadsheets for some scientific. statistical uses.

BY RICHARD AARONS

The spreadsheet enabled millions of managers, academies, and engineers to look at numbers in an entirely new and efficient way. Now a product that holds promise of marking yet another milestone in the way we use PCs to examine numbers has been introduced by Pacific Crest Software: Point Five. What Point Five does is easi-

er seen than described, but basieally it's an interactive mathematical scratchpad that supports calculations, statistical analysis, modeling, graphics, and applications development.

BASIC has an interactive calculator mode: for instance, you type "? 31.5 * 8" and BA-SIC answers "252". Point Five works in a similar fashion but is vastly more powerful. It supports 150 functions-linancial, statistical, graphical, matrix, and sensitivity, as well as han-

dling hasic data manipulation. According to Dan Apple. president and founder of Pacific Crest Software, "We created Point Five to overcome users' frustrations with the cumbersome mechanics, limited functionality, and confining structure of conventional programs. We wanted a tool that would be fast, flexible, and responsive-a tool that lets users structure a problem one way, take a look at the results, and then restructure it quickly for a different type of analysis."

The illustration shows the Point Five screen. The lower portion is the scratchpad, where formulas are entered and edited. Answers appear on the top



Doint Eliza formation are entered and edited on a prost-based on the bottom half of the screen, with answers scrolling up the top half. The \$195 program supplies 150 math. statistics, and finance functions; for some applications, it's superior to a spreadsheet

sereen, serolling up from the screen break.

Matrix Analysis

Point Fire variables can represent a single data element or a two-dimensional table of data elemente A table variable can be used anywhere a single data element can be used, so masses of data can be manipulated with a single command or in a function or procedure. Obviously, matrix analysis is one of Point Fire's strong features.

In a typical application, a user creates and loads variables. then manipulates these variables with constants to produce interim results that are posted above the scratchpad. The user always has an audit trail and can go back to edit an earlier expres-

A block of work can be marked as an application or subroutine to be used again in the eurrent worksheet or transported to other Point Five worksheets.

Point Five makes use of the function keys for calling help sereens, invoking the editor, and making full and partial copies to disk. It also uses several Alt-key combinations for word-processor-style block. copy, and cut-and-move com-

mands. (These commands are used to move formulas around just as they are used to move words or phrases in a word proeessing environment.)

On-disk Help

Point Fire's on-disk help is good but not context sensitive. If you can define your help needs at the command level (for example, seeking help for a speeific statistical function), Point Fire will take you directly to the appropriate help page. Otherwise, you are prompted to step through a series of point-andshoot menus to get to the page

Documentation comes in three parts and is excellent; it is well written, has good graphies, and-most important-offers thorough explanations of Point Fire functions. A 68-page tutorial, which can take 2 or 3 hours to complete, demonstrates Point Five's major features. There is also a lesson file on the distribution disk

An important element of the documentation is a 180-page reference manual: its first seetion covers Point Fine's overstional features, while the bulk of the manual is devoted to an indepth explanation of each of the 150 functions.

Room for Improvement While the core of Point Five is in good shape, some of the peripheral features need help. The graphies portion is not as powerful as that of standalone programs, the use of color is nil outside of graphies, and there's no way to import or export files to and from 1-2-3 worksheets. However, Point Five can read and write ASCII and DIF for-

During our review. PC Magazine showed Point Five to three technical lypes-a technieal writer who spends hours daily erunehing numbers for reports, an aviation sales engineer, and a law enforcement statistician. All work with spreadsheets daily. They played with Point Fire's tutorial for about an hour and then tried their own applications.

Each of the three found Point Five has an intuitiveness about it that makes on-the-fly ealeulations (the old paper-and-peneil thinking technique) much easier than they were in the spreadsheet environment. The informal technical panel also agreed that while Point Five does not pose a direct threat to Lotus's 1-2-3 and other spreadsheets, in the future serious spreadsheet users may turn to Point Five for heavy-duty analysis.



Pacific Coast Software Inc. 887 NW Grant Ave. Corvallis, OR 97330 (503) 754-1067 List Price: \$195 Requires: 256K RAM, two floppy disk drives, Supports 8087/80287 coprocessor. In Short: A free-form calculating environment that supports multidimensional variables and provides 150 math, scientific, statistical, and financial functions. A new way of looking at numbers: for some applications, better than a spreadsheet. Not genry protected. OPICLE 421 ON READER SERVICE CARD

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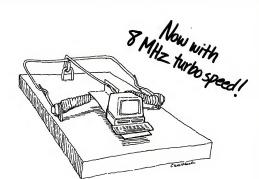
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- Two parallel ports, two RS232 serial ports end geme port



Actually, there's a for more. Like a built-in clock/calendar with battery back-up, support for en optional 8087 math coprocessor, RAM disk software, a print spooler (slong with several useful public domain programs) and a hinged, metal XTstyle case with six excansion alofs.

CIRCLE 372 ON READER SERVICE CARD

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■ NEW ON THE MARKET ■ PAUL M. STAFFORD

Hard Cards Expand: Express Systems Offers Seven Models. from 20 to 60 Mbytes

Express Systems has taken the hard disk card concept into new realms of mass capacity. It offers seven models in its Hard DiskCard series: the \$449 20AT-which is a 20-megabyte, 60-millisecond unit designed to work with the PC AT and compatibles; the 2060 and 2080 (\$595 and \$495, respectively)-20-megabyte, 60- and 80-millisecond units for the PC and XT: the 3060 and 3080 (\$795 and \$695)-30-megabyte, 60- and 80-millisecond units; the \$995 4080-a 40-megabyte, 80-millisecond unit; and the record-setting 6060-a

60-megabyte, 60-millisecond

File Recovery Programs

From Two Companies That Challenge Norton

Two companies have followed

Peter Norton Computing in try-

ing to make money off other

\$49.95 SafetyNet is a memory-

resident program that catches

files as the user erases them,

moving them into a hidden di-

rectory. SafetyNet's main menu

lists all files in this hidden direc-

tory so that they can be easily

Capitalizing on the problems

1-2-3 has with partially dam-

aged files is Spectrum Com-

puter Consulting with its

\$49.95 Rescue. Rescue collects

undamaged portions of a dam-

aged spreadsheet (from both

Releases 1A and 2) into a new

spreadsheet, getting around

1-2-3's inability to read in dam-

List Price: SuferyNet, \$49.95.

Data Corp., P.O. Box 1711.

List Price: Rescue, \$49.95.

(617) 644-0337.

Requires: J28K RAM, Spectru

Requires: 4K RAM, Westlake

Austin, TX 78767; (512) 474-4666

CIRCLE 439 ON READER SERVICE CARD

aged files.

expunged or called back.

Westiake Data Corp.'s

people's mistakes.



unit that sells for \$1,095. All models draw 11 watts from the power supply and occupy 11/2 expansion slots, with

the exception of the 4080 and 6060, which each draw 20 watts and take up two slots. All models include Auto DiskSave backup software.

List Prices: 20AT, \$449; 2080. \$495; 2060, \$595; 3080, \$695; 3060, \$795; 4080, \$995; 6060, \$1,095. Express Systems Inc., 1254 Remington Rd., Schaumburg, IL 60195; (312) 882-

price per megabyte.

7733, ext. 3600; (800) 341-7549, ext. 3600 (conside III.)

CIRCLE 432 ON READER SERVICE CARD

HOT PROSPECT

Epson's EX-800 Nine-Pin Dot Matrix Printer Offers Speed, Ease of Use

Torrance, Calif.-based Enson America has pulled a fast one with its 80-column EX-800-a ninc-pin printhead dot matrix printer. Operating at a claimed print speed of 300 characters-persecond draft and 54-cps near letter quality, the EX-800 lists at \$749 Flexibility and ergonom-

ic features are abundant on the EX-800, including an eight-button panel that lets users switch easily among eight typestyles (draft, pica, elite, normal, roman, NLO sans serif, proportional, and push-feed tractor; a "zero tear-off" capability that prevents waste of pages or numbered forms when printouts are removed; and automatic single-sheet alignment. The EX-800 accepts both

Epson and IBM control codes, has an 8K-byte buffer, and comes with a 1-year warranty.

List Price: EX-800, \$749. Epson America, Computer Products Div., 2780 Lomita Blvd., Torrance, CA 90505; (213) 539-9140, (800) 421-5426 (outside Calif.).



Votan Voice-Mail System Recognizes Voices,

Supports 400 Users on XT Voice-recognition technology has always been the specialty of Fremont, Calif.-based Votan. Now Votan has incorporated its technology into a voice-mail system that, after only a few

minutes of "training," will rec-ognize voice commands over

the phone. The Votan Voice-

Mail system is sold as a turnkey Modem Options Multiply: Five Makers Introduce Models with Low Prices,

novative Features Modem makers are saturating the communications market with products that of-

fer more features than ever at better prices than ever. Leading Edge Products' \$149.95 half-card Model "L" is a Hayes-compatible

1.200 bit-per-second modem that includes BITCOM software Prentice offers its \$325 P212ZX 1,200-bps external modem, which is compatible both with the Hayes stan-

dard and with Prentice's POPCOM family of modems, and includes automatic voice/data switching. Anderson Jacobson's \$599 AJ 2412-AD3H is a standalone Hayes-compatible 2,400-bps unit that features several security options and a 25-number

OmniTel's Encore 2400 HB is its \$399 entry into the 2,400-bps, half-card internal market. The Encore 2400 HB is compatible with all industry transmission standards, but not the Hayes command set, and includes

RITCOM software

auto-dialer.

Data Race's \$1,495 RACE Tower upright external modem (not Haves-compatible) has a claimed transmission throughput of 1,000 error-corrected characters per second (equivalent to about 10,000 bps) using data compression.

Computer Consulting, 9 Burditt Rd., North Reading, MA 01864: CIBCLE 440 ON DEADER SERVICE CARD package containing an IBM XT. hard disk, voice-recognition cards, and software. The system allows up to 400 users to record, send, and distribute messages on a \$19,450 four-channel system with 60 megabytes of mass

storage. List Price: Two-channel, 30-Mbyte VoiceMail system, \$10,950; four-channel, 60-Mbyte system, \$19,450. Votan, 4487 Technology Dr., Fremont, CA 94538: (415) 490,7600

CIRCLE 438 ON READER SERVICE CARD



Data Race's \$1,495 RACE Tower m dem's LCD displays line-quality analusis. The Tower has a small footprint. List Price: Model "L" \$149.95. Leading Edge Products Inc., 225 Tumpike St., Canton, MA 02021;

(800) USA-LEAD.

CIRCLE 433 ON READER SERVICE CARD List Price: P212ZX, \$325. Prentice Corp., 266 Caspian Dr., P.O. Box 3544, Sunnyvale, CA 94088-3544; (408) 734-9810.

CIRCLE 404 ON READER SERVICE CARD List Price: A12412-AD3H

\$599. Anderson Jacobson Inc., 521 Charcot Ave., San Jose, CA 95131: (408) 435-8520.

CIRCLE 408 ON READER SERVICE CARD List Price: Encore 2400 HB, \$399. OmniTel tnc., 5415 Randall Pl., Fremont, CA 94538; (415) 490-2202

CIRCLE 496 ON READER SERVICE CARD List Price: RACE Tower. \$1,495. Data Race Inc., 5839 San Sebastion Pl., San Antonio, TX 78249: (512) 692-3909.

CIRCLE 437 ON READER SERVICE CAR

Muttifunction Cards Get

Increased Functions Board makers are putting more and more functions on single

cards. American Computer & Peripheral's AboveFunction Card has ports, a battery-backed clock/calendar, and up to 2 megabytes of expanded RAM.

Univation's Dream Board includes the I/O ports and RAM and also adds an 8086 coprocessor that brings your PC or XT up to a 10-MHz clock speed.

IDEAssociates' \$1,795 All Aboard has I/O ports, 2 megabytes of expanded memory and a clock, and adds an EGA-. CGA-, and MDA-compatible display adapter and a hard disk controller.

List Price: AboveFunction Card with OK RAM, \$380; with 2 Mbytes of RAM, \$820, American Computer & Peripheral Inc., 2720 Croddy Way, Santa Ana, CA

92704; (714) 545-2004.

CIRCLE 441 ON READER SERVICE CARD List Price: Dream Board with 0K RAM. \$795; with 512K RAM, 5995. Univation Inc., 1231 California Circle, Milpitas, CA 95025: (408) 263-1200.

CIRCLE 442 ON BEACED SERVICE CARD List Price: All Aboard, \$1,795. IDEAssociates, Inc., 35 Dunham Rd., Billerica, MA 01821; (617) 663-6878

CIRCLE 446 DN READER SERVICE CARD

\$39.95 Spreadsheet: The

Thinker includes 1-2-3 **Functions** The craze for low-cost 1-2-3 clones has hit rock bottom. price wise. TexaSoft's \$39.95 The Thinker is not an exact clone, but TexaSoft claims that it supports all the math, statistical, and financial functions of 1-2-3, Release 1A. The Thinker's spreadsheet size is only 26 columns by 125 rows, and it doesn't import .WKS-format files, but it will read in .DBF or

List Price: The Thinker \$39.95 Requires: 128K RAM, TexaSoft

DIF files

Inc., P.O. Box 1169, Cedar Hill, TX 75104; (214) 291-2115. CIRCLE 443 ON READER SERVICE CARD

Toshiba T1100 Plus Laptop Features Two Floppies: Zenith Z-181: 12-pound "Clamshell." Two Drives

Two major laptop portable players have enhanced their offerines.

The only quibbles PC Magazine Labs had with Toshiba America's \$1,995 T1100 portable PC ("DOS to Travel," PC Magazine, Volume 5 Number 13) concerned its single instead of dual 31/2-inch disk drive configuration, its 300-bit-persecond instead of 1,200-bps Hayes-compatible internal modem, its 512K-byte instead of 640K internal RAM, and its unusual func-

tion-key and number-key layout (with two half-rows for each). With the introducalso note the placement of the drives. tion of the \$2,399 T1100 Plus, Toshiba has addressed and resolved every one of these complaints. The T1100 Plus is based

on Intel's 80C86 microprocessor and operates at clock speeds of either 4.77 or 7.16 MHz. Its display screen is the same as that of the T1100, but Toshiba claims that a new display adapter handles color-togray-scale conversions better. An enhanced disk-drive interface can connect to Toshiba's external 514-inch floppy disk drive, or it can connect to a desktop machine for drive-sharing. The function and number keys are laid out along the top of the keyboard in separate rows. The T1100 Plus



weighs 10 pounds-1 pound

tures 640K beses of RAM, a 1,200-bitper-second modem, an enhanced function-key layout, two 720K 31/2-Inch Soppy disk driver, a serial port, and an enhanced display adapter.



Zenith's \$2,399 Z-181 Portable PC feat tures a backlit electroluminescent LCD screen, 640K byses of RAM, and two 31/2inch floppy disk drives. Note the brightness and contrast controls for the screen:

it will replace in Toshiba's product line.

Not to be outdone. Zenith Data Systems (whose \$2,399 Z-170 PC won the Internal Revenue Service contract last winter) introduced the Z-181 Portable PC. For the same price as the Z-170, which continues in Zenith's line, the Z-181 weighs 11.8 pounds, features two 31/2-inch floppy disk drives, 640K bytes of RAM, a backlit electrolumipescent LCD screen with the same aspect ratio as the IBM PC, and a rechargeable battery that Zenith claims is good for up to 5 hours. The Z-181 also features a full complement of output ports, including serial, parallel, RGB, and composite video. and a 51/4-inch floppy disk drive interface.

List Price: T1100 Plus with 256K RAM, \$1,995; with 640K RAM, \$2,399. Toshiba America Inc., Information Systems Div., 2441 Michelle Dr., Tustin, CA 92680: (714) 730-5000.

CIRCLE 430 ON READER SERVICE CARD List Price: Z-181 Portable PC, \$2,399. Zenith Data Systems Inc., 1000 Milwaukee Ave., Glenview, IL 60025: (312) 391-8949.

CIPICLE 431 ON READER SERVICE CARE

Tseng, PC's Limited EGAs Offer Features, Low Price

HANDS ON

BY JOE DESPOSITO Two recent EGA display boards are competing with IBM-the one from Tseng Laboratories on features and price, and the other, from PC's Limited, on price alone. The Tseng board, called EVA, adds hardware zoom, 132-column mode, and a parallel port for \$525. The PC's Limited board, called EGAds!, offers IBM EGA emulation at a

rock-bottom \$769 The two EGA boards were received too late for review in "Achieving the Standard: 12

EGA Boards" on page 140. Because of time constraints, these Hands On first looks could not include the usual full range of PC Magazine Labs compatibility and performance tests.

Both boards offer the standard array of EGA features such as displaying a 64-color palette and supporting smooth scrolling and panning, split screens, and redefinable fonts. Both include 256K bytes of memory (an option for IBM) and use custom VLSI chips.

Tseng 132-Column Mode On the Tseng EVA with hardware zoom in operation,

and located under software control in either text or graphics modes. Zooming makes an area look as if a magnifying glass were being moved around the screen. The zoomed area can also be displayed in scaled

Four different screen dimensions can be produced with the Tseng board: 80 by 25, 132 by 25, 132 by 28, and 132 by 44. A utility disk included in the package has display drivers for 1-2-3, Release 2, or Symphony,

Version 1.1. An optional \$50 CMH mod-

equately showed the training.

sales, and educational potential

InfoWindow's display-

screen technology involves us-

ing piezoelectric crystal ele-

ments located in the screen's

four corners rather than a wire

mesh imbedded in the screen.

The voltages generated by the

stress produced by touching the

screen are analyzed within the

display to provide localization

resolution of 1/4 inch.

Piezoelectric Crystals

of the unit.

software written for the IBM color/graphics and monochrome adapters and with the Hereules Graphics Card. Without this board, EVA is only as compatible as the IBM EGA is with the IBM color/graphics and monochrome adapters.

As mentioned, both the Tseng and PC's Limited boards use custom VLSI chips. The Tseng chips are manufactured by Tseng; the PC's Limited chips are by Chips and Technologies. Each company includes its own BIOS on its board.

There's not much to say about the PC's Limited board other than that it acceptably emulates the IBM EGA for a mere \$269 and that the price includes a 256K-byte display memory on board. If you don't need special features, it's a good choice.

ule offers compatibility with FACT than 350-line resolution but ad-

EVA Tseng Laboratories Inc. Newtown Industrial Comm 205 Pheasant Run Newtown, PA 18940 (215) 968-0502

In Short: An EGA board with additional features such as 256K. display memory standard, alternative screen dimensions (132 by 25, 132 by 28, and 132 by 44), hardware zoom, and a parallel printer port. Also includes software drivers for 1-2-3. Release 2, and Symphony, Version 1.1. for the alternative scre A good choice for anyone re-

List Price: \$525; CMII option,

quiring these added features. CIRCLE 444 ON READER SERVICE CARD **EGAds** PC's Limited 1611 Headway Circle, Bldg. 3 Austin, TX 78754

(512) 339-6800 List Price: \$269 In Short: An EGA board that includes 256K display memory standard at a rock-bottom price. If standard EGA features are the only requirement, this board is an attractive buy.

CIPCLE 445 ON READER SERVICE CARD

IBM New Releases: InfoWindow, Sys/38

BY CRAIG L. STARK NEW YORK-Though Joan Rivers was absent, "Can we talk?" was the theme when IBM recently introduced more than 100 new products. Both the all new, seven-model System/38 and the revamped fourmodel System/36 mini lines will be able to communicate directly with each other-without mainframe mediation-through a system called Advanced Peerto-Peer Networking (APPN). Furthermore, a new Server-Requester Programming Interface (SRPI) has been developed to permit PC-class micros to share data with 370s, using virtual files to convert data on an asneeded basis between the different micro/mainframe formats. New adapter cards and software will also increase the connectivity range of the RT PC workstations introduced last January.

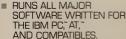
Touch-screen Interaction Among IBM's other new communications products was the \$4,195 InfoWindow disThe InfoWindow display allows touch-screen interaction with graphics materials generated internally or stored on a conventional 54 000-frame laserdisk Scheduled for fourth-quarter availability, the InfoWindow demo material at the press briefing was limited to 200- rather

EGA-equipped PC-XT or AT.

With the IBM InfoWindow system you select an op ing the appropriate hos on the screen

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New Hercules Card Bridges Repair A.C.T. World of Text, Graphics



Technology

HANDS ON

'Herc Plus' offers speed advantage over bit-manned graphics cards.

BY CHARLES PETZOLD Hercules Computer Technology, the only company besides IBM that has succeeded in establishing a video standard for the PC, refused to get on the EGA color bandwagon. Instead, Hercules has announced the Graphics Card Plus, its first new product in 2 years and a significant advance over the Her-

cules Graphics Card. The \$299 Graphics Card Plus is a functional superset of the well-known Hercules Graphics Card for the monochrome display. Like the earlier Hercules board, the "Here Plus" supports the normal IBM 80 by 25 monochrome character mode and the Hercules standard 720 by 348 bit-mapped graphics mode. In addition, the Herc Plus adds a third mode that is not quite graphics and not quite character but combines the best features of both.

Hercules is betting that the lower price, better resolution, and established user-base of monochrome displays will conThe Mercules Graphic Card Flux - Featuring Sanfort" Made

ON APPRIORIE OF TO MARK DEPTENDED DAMNOTIONS. TWEET'S TOLER HATELY AS

facts can be created for titles or exphasis. Fast-out" is fast and easy Now It will be easy for word processing and bases to laplement superscript the car & create " those & metals & that " you be realfy "s read Emfant" embines the speed and coor-of-war of test ands with the correctility of prophies ands.

Bent made will meren be the come count. The \$299 Hercules Graphics Card can display up to 12 256-character fonts (above) and limited graphics while maintaining the speed of a text-only display.

tinue to make the "green screen" the corporate favorite. Hercules is also expecting the speed degradation inherent in today's bit-mapped graphics displays to be ultimately unsatisfactory for users. When the smoke clears over the battle between text modes (speed) and graphics modes (versatility). Hercules hopes the winner will he: RamFont

RamFont Video Mode

RamFont is Hercules's term for the new video mode on the Graphics Card Plus that allows programs to display different fonts and limited graphics while still maintaining the speed of a character display. Up to 12 256character fonts may be loaded into the upper 48K-byte region

of RAM on the Graphics Card Plus board Instead of the nonmal 8-bit ASCII code and 8-bit attribute code, character data uses a 12-bit character code and a 4-bit attribute code. The expanded character code allows the display of 3,072 (12 fonts times 256) different characters on the screen. The attribute code includes support for hard-

ware blinking, high intensity, strike-out, and boldface.

The 12 separate fonts give the Graphics Card Plus a big advantage over the text modes of IBM's Enhanced Graphics Adapter (EGA). The EGA can store four 256-character fonts in text mode and can display only two at any time. The fonts may be 4 to 16 scan lines high on the Here Plus card and 1 to 32 scan lines high on the EGA. On both cards, the fonts are either 8 or 9 dots wide. The 9-dot-wide font is restricted to 8 dots of data with the 9th dot displayed as

background (except for the line and block characters that need to connect on the horizontal). No Proportional Font The Herc Plus and the EGA

are both incapable of displaying proportional fonts in text modes and cannot use different line heights on the same screen. However, the larger memory area allowated for fort storage in 2550 Ninth St., #210 Berkeley, CA 94710 (415) 540-6000 List Price: \$299 Requires: IBM Monochrome Display or compatible. In Short: An interesting approach in the Graphics Cord Plus bridges the gap between text and monochrome graphics modes while providing full compatibility with the Hercules Graphics Card.

CIRCLE 424 ON READER SERVICE CARD

the Herc Plus card lets the board display large-sized letters by piecing together font fragments from several different font tables. Large letters and small letters can be mixed on the same screen, something normally possible only with a bit-mapped graphics display.

RamFont is ideal for a program such as Microsoft Word. which can display different fonts but not different character sizes. Word usually requires a graphics display for this onscreen formatting. The Herc Plus board includes a driver for Word. Version 3.0, that sunports all the Word character formatting while still maintaining the speed of the character mode. (In theory, a 14-scan-line high character can be scrolled seven times faster in character mode than in graphics mode, but the difference in Word 3.0 is not nearly this great.)

The Here Plus card also comes with drivers for 1-2-3, Release 2, and Symphony, Version 1.1, for a 90 by 38 spreadsheet display. Although a 90 by 38 Hercules driver is already included with these packages, the older one uses the 720 by 348 graphics mode. The Herc Plus card does it in character mode and thus provides significantly faster scrolling.

By treating the alternate font memory as if it were bit-mapped (constrained an east page)

Hercules Card Battles the Clones

The new Hercules Graphics Card Plus and its predecessor, the Hercules Graphics Card, are to carry the same \$299 list price. The Hercules Graphics Card was previously 5499

Hercules says the new card will initially be sold close to list price, while the original card will continue to be discounted. Add in a \$50 company rebate through the summer and the original will

cost as little as \$140. Hercules president Kevin Jenkins denies that the pricing aims at clone makers that sell Hercules knockoffs for as low as \$100, but he says, "If the difference is only 530 or \$40, fewer people

will buy clones. -Charles Bermant

Hercules

graphics memory, software can also combine text and graphics-like images on the same screen. Additional 1-2-3 and Symphony drivers included with the Here Plus board provide a startling example of this by displaying a graph on a corner of the spread-sheet. The worksheet is in character mode so it serolls and updates quickly, but the graph is plainly bit-manufacture.

The Here Plus card comes with the same software as the Hercules Graphics Card and adds a font editor, font loader, and several sample fonts. Full technical information on using RamFont comes with the board. A sample chess program (with assembly language source code) shows how to use RamFont to create graphics icons and move them around as if they were characterdata Unlike the EGA. the Here Plus card does not include a BIOS extension for support of more than 25 character lines on the screen.

How Much of a Future? It will be interesting to see if software support develops for the RamFont mode of the Hercules Graphics Card Plus. Microsoft Word adapts very well to this mode, but other programs may not be as well suited. Microsoft Windows, for instance, relies on bit-mapped graphics and proportional fonts to such an extent that a faster Windows driver using RamFont would be virtually impossible. (Of course, Windows can still run on the old 720 by 348 graphics mode supported by the Herc Plus card). Moreover, the imminent availability of video adapters based on dedicated graphics chips is destined to eliminate many of the speed problems currently experienced with bit-mapped graphics dis-

While the Hereules Graphics
Card Plus RamFont mode is
surely an unusual and interesting solution to the speed problem of bit-mapped graphics,
even at \$299 it may be a little
too late and a little too offbeat to
have a significant impact on the
video adapter market.

Above Board PS/AT Extends Intel Line

HANDS ON

BY CHARLES PETZOLD

The Above Board PS/AT rounds out Intel's strong line of extended and expanded memory products for the PC and AT. Just as the Above Board/PS is a multifunction version of the Above Board/PC. The Above

Above Board/AT and adds par-

allel and serial ports.
The Above Board PS/AT can hold up to 1.5 megabytes of memory (the Above Board/AT holds 2 megabytes). The parallel port can be set for either LPT1 or LPT2 (which become LPT2 or LPT3 if a monochrone card is also in the system), and the serial port is either COM to COM2. A \$995 piggyback board can add another 2 megabytes to the configuration; it's the same board that's available.

or the Above Board/AT.

Two Kinds of RAM

DIP switches on the board specify the starting and ending addresses of AT-type extended memory in 51 2K-byte increments up to 8 megabytes. You may also use 128K of the board's memory to backfill conventional memory from 512K to 640K. Anything left over can be used for Lotus/Intel/Microsoft extended memory.

For users who want more and more memory, the Above Board RS/AT can coessist with one or more Above Board ATs. Since the Expanded Memory Manager driver program can access expanded memory from four different Above Board/AT or PS/AT cards, you can easily reach the 8-megabyte maximum allowed under the Lotus/Intel/Microsoft expanded memory specification.

FACT

Above Board PS/AT Intel Corp. 5200 NE Elam Young Pk wy. Hillsboro, OR 97124

1830 681-8080 List Price: With 128K RAM, 5595, 512K, 5695, 1-5 Mbytes, \$1,095, With 2 Mbytes RAM of piggyback RAM, \$995. Requires: iBM PC AT or com-

patible

In Short: Well-built 128K to 3,5-Mbyte memory board for the PC AT, similar to the Above Board-AT, with parallel and serial ports added, Memory on the apportioned uniong conventional, expanded, and extended RAM First-tale installation guide.

Shortcuts for Experts The short and concise

"Hacker's Guide" that Intel began including with its Above Boards following some early negative reaction to its setup program has been renamed Shortcuts to Installing the Above Board PS/AT for DOS Experts." By "DOS Experts, Intel means people who are familiar with the concepts of conventional, extended, and expanded memory, know how to set DIP switches, and can edit AUTOEXEC BAT and CON-FIG.SYS files. For everyone else, there's an extensive manual and configuration program to help out with installation. The software includes a memory check/diagnostics utility. plus RAMdisk and print buffer programs that use either conventional or expanded memory.

conventional memory, expanded memory, expanded memory, and parallel and serial ports on one card, the Above Board PS/AT is an excellent first board for the new PC AT owner. Vetanan PC AT owners who have already run out of expansion slots can also benefit by replacing some of their older boards with the Above Board PS/AT.

By combining backfilled

For multifunction card users who want more and more memory, the Above Board PS/AT can coexist with one or more of Intel's Above Board/AT expanded memory cards.



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■ PC UPDATE ■ CHRISTOPHER JOHNSTON

IBM Corp. released PC-DOS 3.21 in the form of a patch to DOS 3.2. Some users get an error when cursor keys on the new IBM keyboard (with 12 function keys) won't respond in BASICA edit mode. The natch fix is available free from dealers where users purchased DOS 3.2.

Javelin Software Corp. of Cambridge, Mass., is moving toward the "selective elimination" of copy protection through corporate software licensing. Javelin will deliver any combination of locked and unlocked Javelin units and leave the decision of who will use those copies to corporate managers. There are four license quantity levels: 50, 100, 250, and 500. Fifty copies of Javelin are \$20,000, or \$400 each. Single copies of the \$695 package remain copy protected.

EMS+ expanded memory boards. The XM environment runs up to four unmodified programs in 8 megabytes of memory concurrently. So, for instance, 1-2-3, dBASE III Plus, WordStar, and Crosstalk XVI can co-reside with no speed or performance degeneration. The DRI operating environment alone retails for \$395.

Homebase, the SideKick-like memory-resident utility, has been trimmed from 180K to 80K bytes in Version 3.0, following its ac-

quisition by Brown Bag Software from Amber Systems. Version 3.0 costs \$69.95, plus \$5 shipping, or \$49.95 for SideKick users who trade in their disks. Upgrades are \$29.95 for registered users of Version 2.0. Brown Bag also dropped copy protection on the new release (Version 3.0) of the Brown Bag Word Processor with mail-

its 24-pin P341, P321, and older P351 dot matrix printers, enabling them to emulate the IBM Graphics Printer and Oume Sprint 11 daisy wheel printer. Upgraded printers will execute full graphic screen dumps from PCs or compatibles and download disk-based type fonts. The kits are: P351 Dual Emulation (DE) kit (\$99), the P341 DE and Down Line Loading (DLL) kit (\$199), the P321 DLL kit (\$99), and the P321 IBM Graphics Printer emulation kit (\$49).

Contact the Information Systems Division of Toshiba America, 2441 Michelle Dr., Tustin, CA 92680. Epson America is dropping prices on hard disk versions of its Eq-

uity line. The Equity I PC compatible dropped 14 percent, from \$2,195 to \$1,895, for the system unit without a monitor or video card; the Equity II XT compatible dropped 14 percent, from \$2,895 to \$2,495; and the Equity III AT compatible dropped 7 percent, from \$4,195 to \$3,895. In addition, Epson is promoting its list Equity I PC, including the \$995 floppy disk version, by including a free LX-80 printer (\$329 list).

Efficiency claims for the Dvorak keyboard may be overstated. At best, typists are 3 to 10 percent faster, according to "The Ergo-

nomics of Office Keyboards" in the Office Systems Ergonomics Report, a bimonthly publication on human factors engineering. The issue, devoted entirely to keyboard ergonomics, labels as unfounded claims by Dvorak keyboard proponents that they can out-type QWERTY users by 15 to 50 percent. The issue costs \$30 and is available from the Koffler Group, 3029 Wilshire Blvd., #200, Santa Monica, CA 90403; (213) 453-1844.



Keytronic 5150 Dvorak keyboard

Visually impaired PC users will find a helping hand in Add-Ons. the Ultimate Guide to Peripherals for the Blind Computer User. The publication is available in type, braille, and on cassette from the National Braille Press, 88 Stephen St., Boston, MA 02115; (617) 266-6160.

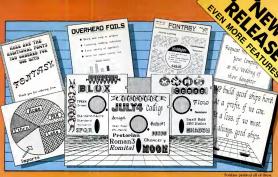
Lotus Development Corp. of Cambridge, Mass., released Signal. Version 1.1. an enhanced version of its \$595 stock quotation service. Signal added listings for the Kansas City Board of Trade and the New York Futures Exchange. Also added is a News Alert feature that flags company listings as relevant news becomes avail-

Lotus also acquired graphics developer Graphic Communications of Waltham, Mass., making GCI the fifth corporation in the Lotus portfolio. GCI markets two graphics programs, Freelance and Graphwriter.

In brief: Grid Systems Corp. reduced the price of its Gridcas

laptop PC by 28 percent, from \$4,350 to \$3,125. The Gridcase 2 dropped 18 percent, from \$3,150 to \$2,595...Bit Software's Bit-Com communications program is now available for \$65. Previously it was distributed through modern bundling... Direc-Tree Plus from Micro-Z Co. is no longer copy protected and has been rewritten in assembly language. Price is \$49.95, and upgrades are \$20, plus \$5 shipping and handling...Western Union now has 70 new databases on its Infomaster service (formerly called InFact)...Fontasy, Version 2, from Prosoft includes 60 pieces of small clip art and has better resolution (240 by 216) than the old version; upgrades are \$25...Oracle Corp. plans to ship Version 5.0 of its Oracle relational database management system for the PC in late summer. No price yet, but Oracle says it will have a user-friendly front end...Generic Software's Generic CADD, Version 2.0, has 100 new features, including macros, plot spooling, and rotation and rescale functions. Upgrades are \$25...Ven-Tel has extended its modem warranty to 5 years on modems purchased after May 1. Earlier warranties were 2 years for internal and 1 year for external modems...Springboard Software upgraded The Newsroom to The Newsroom Pro. Enhancements include no copy protection and 2,000 pieces of clip art, which can be resized and flipped around. Upgrades cost \$60...Business Tools released TAS-Plus, a \$69 version of its TAS relational database manager. The older version (\$199) is still in circulation-...Lifetree Software halted direct sales of its Volkswriter word processor, it's still available through retail channels...AST released a new version of its RAMpage AT memory board compatible with 8-MHz PC ATs. AST will replace existing RAMpage AT boards free for owners who have compatibility problems...IBM released an updated version of its desktop Series/I minicomputer using an 8-MHz PC AT with a 30-megabyte hard disk. The unit runs bot

Series/1 and PC-DOS software.



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■ REVIEWS IN BRIEF ■ EDITED BY PAUL M. STAFFORD

The Twin: Slow Lotus for Less

BY CHRISTOPHER BARR Another 1-2-3 clone, called The

Another 1-2-3 clone, called The Twin, has found its way into the marketplace. A more appropriate name, however, might be "The Little Brother." This non-copy-protected program looks a lot like the big guy but doesn't quite measure up.

If you use 1-2-3, you will feel comfortable working with The Twin. The menus are nearly identical, the worksheet is as large as that of 1-2-3, Release 2. the help screens are similar, and the spreadsheet looks the same. One small difference with The Twin is that the worksheet is displayed at the top of the monitor. with the control panel at the bottom, while 1-2-3 reverses the order. The Twin doesn't show you the date, as does 1-2-3. Release 2, but it does display available memory in a status box on the screen. When you are in the "ready" mode. The Twin adds a nice touch: it displays the meanings of the function keys, obviating any need for those handy little function-key templates you get with Lotus's package and promptly lose the next day. If you have a color monitor, you can select different colors for the worksheet, including the foreground and background and the inverse foreground and background; there is no choice with 1-2-3.

Better Graphics

The Twin has it all over 1-2-3 when it comes to graphics capabilities, offering both analysis and presentation-quality graphs and charts. Choose analysis when you want to quickly view data in simple graphs for analytical purposes, pick the presentation-quality mode when you want to impress your boss. 1-2-3 offers five graph choices: line, bar, xy, stacked bar, or pie, with up to six data ranges. The Twin adds such options as a choice between horizontal and vertical bar charts and pie-bar charts to this repertoire. It does both in three dimensions, and you can use up to eight data ranges. The horizontal and vertical bars can be stacked, clustered, positive, or positive and negative. Options for presentation-quality graphs include a choice of colors, font type, font size, and natterns. The screens from which you make the selections are easy to use.

That covers much of the good news. The bad news is that The Twin is s-1-o-w. Using the

PC Magazine Labs 1-2-3 benchmark test; we clocked the amount of time it took to enter data and then execute five basic commands. The Twin took nearly 16 minutes to complete the est on a floppy-based XT with 640K bytes of RAM; 1-2-3 did it in 3 minutes and 5 seconds. The difference between the two was so ereat that, thinkine I had

a defective copy. I tried it with a different copy of *The Twin*. The results were identical. On the plus side, *The Twin* adds a few features that big brother might be jealous of. Added financial functions include @mirr, which calculates

FAC FILE

The Twin
Mosais Software Inc.
1972 Minsonchuseits Ave.
Control Control
(1971 Minsonchuseits Ave.
Control
(1971 Minsonchuseits Ave.
Control
(1971 Minsonchuseits)
Requires 320R RAM, two
disk drives, DIOS 2.0 or later.
In Short: The Twin is an integrated spendablose program
similar to 1-2.3 that has better
graphics but a lower operational spend. Not copy protected.

Software Carousel Runs Many Programs at Once

(continues)

BY PAUL M. STAFFORD

Cheap mass RAM and cheap mass disk storage have one draw-back: people want to use them—all the time. Whether they need to or not. Software Carouse! lets such people quench their thirst for using RAM and can radically improve the way they work in the process.

Software Carousel lets you simultaneously load as many programs as you can think of into as much RAM as you can cram into your machine, and you can switch easily between

them. If you don't have much RAM, it can trade programs and open files onto up to 6.4 megabytes of hard disk space. Is this multitasking? Actually, it's much simpler. Software Carousel partitions memory into whatever-size chunks each program needs (in increments of 16K bytes). You activate a chunk by hitting a user-prochunk by hitting a user-pro-

whatever-size chunks each program needs (in increments of 16K bytes). You activate a chunk by hitting a user-programmable "hot key" combination; only the partition that is active uses the PC's central processor. Programs stop dead when you switch to another par-



The Twin spreadshees look, much like 1.2 Fs. with two exceptions, as command little is across the bottom of the screen, and it gives you a menu of function keys.



The Software Catours? I store shows you the programs in our passition and the amount of RAM you have allocated to it, as well as options for reconfiguring.

The Twin

a modified rate of return, and @rate, which will calculate the rate of return on an investment for n periods of time. Logical functions available are @and, @or, and @not. The Twin has extra macro commands for moving around the spreadsheet. Be careful, though: The Twin can read 1-2-3 files, but 1-2-3 will not recognize The Twin worksheets or macros unless you save the files with the Translate command. If you save your files normally, 1-2-3, Release 2, will give the error message "Worksheet file is out of date." and Release 1 A will dismay you with the information that what you have fed it is "not a valid worksheet file."

If you don't work with large spreadsheets, chances are you won't be put off by The Twin's sluggish performance. If you want more graphics than 1-2-3 can offer, this package may be a good choice. For \$145, I'd say, "Hello, little brother."

Software Carousel

tition and resume where you left off when you return. On one hand, there's no background processing. On the other, programs run at normal speed.

The Software Carousel includes slick touches like protecting you from accidental rebooting (essential when many programs are loaded at once),



Software Carousel SoftLogic Solutions Inc 530 Chestnut St. Manchester NH 03101 (603) 644-5555 List Price: \$49.95 Requires: 256K RAM, hard disk drive. DOS 2.0 or later. In Short: Fast, easy switching between programs through memory partitioning. Copy protected for three installations CIRCLE 622 ON READER SERVICE CARD letting you name partitions, and writing the partition name above the DOS prompt in each partition. You can automate each partition to load the program you want into it by setting up Software Carousel to execute the equivalent of a batch file when you activate a partition for the first time.

Since the key combinations that select partitions can be either the Ctrl. Alt. Left Shift. Right Shift, or Break keys in combination with the function keys, there need be no keyboard

incompatibilities with your favorite programs. I had no problem running XyWrite III. BA-SICA, Webster's New World Spelling Checker, and Powerbase all at once on a 640K-byte XT using 640K bytes of hard disk space as virtual RAM.

At least one program does conflict with Software Carousel: SideKick. A call to SoftLogic Solutions' support line confirmed that the company knows about the problem and plans to fix it in the next release. For registered users who can't wait.

SoftLogic Solutions maintains a special bulletin board that contains the absolute latest, as-yetunreleased versions of the nrogram that may (or may not) solve any incompatibility you

come across. If you want background processing and true multitasking, go elsewhere. If you want to max out your hardware's capabilities and make quick, easy switches between several programs, Software Carousel might be the \$49.95 bargain that you're looking for.

Strike Out Those Typos

BY JANET LEWIS

If you're a lousy typist, or a lazy one, a memory-resident spelling checker like S&K Technology's Strike is a nifty idea. It catches your typos as you make them, and you don't even have to leave your file. At least two other companies

also thought of this idea; Borland International offers Turbo Lightning and Cornucopia Software offers Whoons! (see PC Magazine, Volume 4 Number 25 and Volume 5 Number 10, for reviews). But for many applications, Strike could be the best of the three. It's great for floppy disk users because its 49,000-word dictionary loads into only 105K bytes of memory and requires no further disk access. And Strike tracks the

screen, not the keyboard; it's

or delete-maneuvers that can throw Whoons! for loops.

Strike doesn't claim to rival Turbo Lightming as a general information-retrieval interface. But since its memory-resident dictionary is more than triple the size of Lightning's largest (which takes 106K bytes with the program), it will beep less often for correct words it simply doesn't know.

Big User Dictionary

When Strike does been, you can add correct words to a user dictionary with up to 3,000 words-more than most spellers allow. You can also add words to the main dictionary, using a unique utility that packs them into Strike's compressed format. If the as-you-type beeping bugs you, you can toggle it off

CIRCLE 621 ON READER SERVICE CARD and use Strike's paragraph or



Strike

S & K Technology Inc. 4610 Spotted Oak Woods Sun Antonio TX 78249 (512) 492, 3384 List Price: \$29.95

Requires: 105K RAM, one disk drive In Short; A speedy memoryresident spelling checker for floppy disk users, poor typists. and middline spellers. Its simple algorithm for suggesting alternative spellings makes it less useful for lousy spellers. Not copy protected.

screen checker just highlights your mistakes; you have to move the cursor to fix them, and the highlighting disappears at the whim of your word processor. The paragraph checker, however, moves the cursor from mistake to mistake, and the highlighting stays until you leave the paragraph.

Strike will list alternative spellings for unknown words and do replacements in your text. But if you're a terrible sneller and want an electronic desk dictionary, Strike isn't for you. It simply suggests all valid words that involve changes, additions, or deletions of one letter or transposition of two adjacent letters. That method covers tvpos you could fix yourself or simple one-letter mistakes, like independance, forrest, or recieve. It's not helpful if you take



When Strike casches you in a typo (using WoodStat in this example), it gives you five options for dealing with it, all handled by function keys.

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Checks & Balances: Home Accounting

BY VICTORIA DANOFF

As banking by phone becomes more commonplace, home-accounting programs like Checks & Balances are finding their way into the software libraries of PC users.

C & B doesn't just balance your checkbook—it helps manage your whole financial picture. Two of its handiest features: it automatically updates your accounts with each transFor typo trapping without pain. Strike is a good choice. It's speedy, it's cheap, and it gives you a lot of dictionary for the RAM it takes.

that don't steal keyboard inter-

rupts, but all the features may

not work. It's compatible with

most other memory-resident

programs.

action, and your account balance is always on-screen. C & B would be even nicer, though, if it could do what-if studies like other programs in its category.

English Commands

With its English commands and fast, on-screen, full-text editor, command-driven C & B is easy to use. To perform basic operations, all you need to remember are six commands. A help screen lists the others. The manual is well organized.

C & B cozes with flexibility.

It will manage multiple check-

in account of the special control of the spec

well as and reports covering any time period up to a full year.

Once you get the hang of all the regular C & B features, the manual's advanced-features section tells you how to create batch files to make the program run faster, track travel and mileage, work from RAMdisks, set

C & B will also print any type

of check: top or bottom stub, or

no stub. It prints balance sheet

and net-worth statements, as

up multiple Rolodex files, and

If you're looking for something to help you with financial tracking and budgeting that won't put too big a dent in your time or your budget, try Checks & Balances.



Checks & Balancer, Version 3.6 CDE Software 948 Tatarous D. Los Angeles, CA 90026 (213) 661-203 List Price; 374, 95 Requirate; 1923, RAM, two disk drives, DOS 1.0 or later. In Short: A version bornescounting program that manages multiple checking, awrings, and credit accounts, prints checks, and much more. Not copy proadr much more. Not copy pro-

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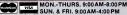
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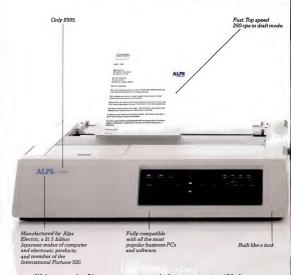
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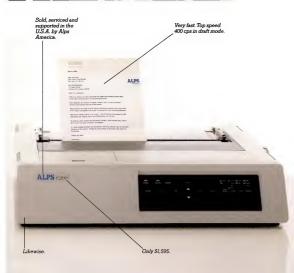
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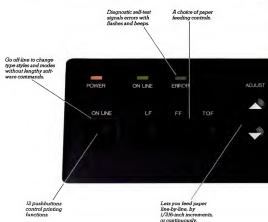
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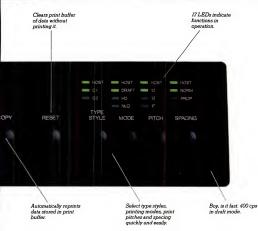


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The built-in print buffer (4K expandable to 256K) also frees up your PC for other jobs while the Alps is still printing.

And in the unlikely event of an operating error, our panel will imme-

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With distinguished beeps and flashes.

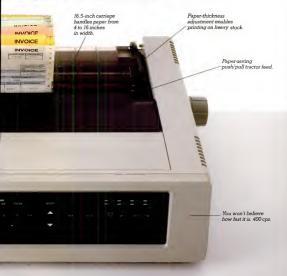
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Most business printers are very picky.

They simply refuse to deal with some of the jobs you have to deal with. Like printing on heavy stock. Or on oversized sheets. But Alps printers are different. They're made to print almost anything your business will ever need. From letters and graphs to six-part forms and 16-inch-wide spreadsheets. And they not only handle most

NYTHING.



everything, they handle it more efficiently.

Both come with a built-in two-way tractor feed (push and pull) that saves paper other printers would normally waste. Plus a choice of three different paper feeding methods, all standard. All in all, you'd be hard pressed to find printers with a greater appetite for work.

TURN UP

P2000 prints at speeds of 250, 125 and 50 cps, fast enough for highvolume work.

Easily accommodates 16-column spreadsheets

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ALPS P2100

P2100 prints at speeds of 400, 200 and 80 cps, fastest in its price range. (We're not kidding, it's fast.)

Kept adequately fed, Alps printers will handle more work than any printers in their class.

Each offers a choice of three speeds. All fast.

The P2100 prints drafts at 400 cps, memos at 200 cps and letter-quality documents at 80 cps, while the P2000 prints at 250, 125 and 50 cps in its three modes.

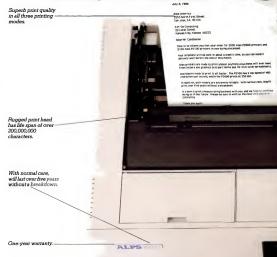
VOLUME. 3 print modes: draft memoand letter quality. Precision-engineered print head is designed for high-speed, heavy-volume printing. 4K print buffer (expandable to 256K) can store up to 128 pages.

So either printer can easily take on all the work an office full of PCs can dish out.

And they'll take care of it faster, thanks to time-saving features like a built-in tractor feed, expandable print buffer and multiple type font cartridges.

In fact, for heavy volume work, Alps printers stack up favorably against much more expensive machines.

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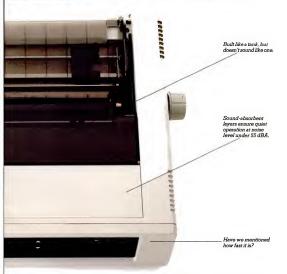


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THIS PAGE.



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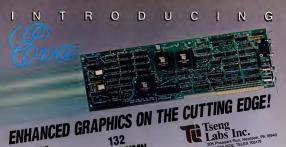
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How we select editor's choice products



When PC Magazine compares products, it pinpoints the best of the breed in each category by awarding it the Editor's Choice. Here's how we make our selections.

In the best of show in our comparison reviews. Whether we're comparing two products or twenty, there's a product that is more worthy of your notice than the others. Sometimes there are several more recent case, our review of MS-DOS portables, there were none. This last example was more a case of minimizing negatives than of maximizing positives. We felt stronger them, and still do, that

the industry had not applied state-of-theart engineering, construction, and materials techniques to the problem of taking a DOS-compatible machine with you. When the insides of portables start looking more like cameras and less like battleships, we'll know that the manufacturers finally understand the problem.

Obvious answers aside, we get the question continually: How do you select the Editor's Choice? Well, it's like high school—if you've done your homework, the rest is easy.

CRITERIA The first thing is to know the ground rules. What are the criteria for judging a product? What actually makes the product useful to you? To answer these questions we look at our own use of the products and talk to users, information center managers, and the manufacturers.

In fact, "Call the manufacturer" is Rule I in our review procedure. It's so important that it's also Rule 2. Time was when a magazine would take a product and conduct its review in secrecy. While we still don't tell the manufacturer what we're going to write, we do call and discuss our findings. There are times when the product's performance is grossly at odds with its claimed or perceived quality. We want to know why because our readers was surely ask. Other times it doesn't work the way they say it should. The documentation may be bad, or we may be using it incorrectly, In any event, we call the manufacturer.

Sometimes a product is miscategorized by its manufacturer. Sometimes it is compared with famous products that it doesn't belong in the same room with. The product in question may be better or worse than said famous product. But there is a distinct tendency in our business to compare apples and oranges—which leads naturally to categorization.

CATEGORIZATION One of the most important things to understand about a product is whom it is intended for. Too many products don't differentiate them-



selves adequately by identifying their target audience. If we see a product for which we or the manufacturer can't adequately identify that audience, warning bells go off.

Aside from apples-and-oranges comparisons (PFS: File and Report versus dBASE III, for example), the intended audience makes a big difference in the level, completeness, and organization of the documentation. It can also influence support, multicopy pricing, and update policy.

It wouldn't be fair to select as Editor's.
Choice a product intended for the corporate
audience over one intended for personal use
because the documentation was more complete. Each should compete with others in its
class. When we rounded up EdA-compatible cards, we felt several were praiseworthy,
but for different reasons. Some had more
performance per dollar, others emulated the
EGA more closely.

MEASUREMENT You can't just plus in a bunch of EAA cards and declare one the winner based on documentation or looks. Contributing editor Charles Petzold spent many hours poring over the IBM EGA BIOS determining exactly blow the board was supposed to perform under a wide variety of (often undocumented) conditions. Then he wrote programs to exercise the boards and test the efficiency of their BIOS's, and only then did he judge their compatibility.

When Petzold ran into a problem, he called the manufacturer to discuss the problem. More often than not, the conversation resulted in our being shipped a new board or a new BIOS chip. often within 24

■ FROM THE EDITOR'S SCREEN

hours. After the tests, Petzold commented that he wished we had an Editor's Choice category for Best Engineer.

Where possible, we try to use industrystandard benchmark tests for evaluating benchmark tests takes us into virgin territo-

products. For example, we based our recent roundup of surge suppressors on the IEEE-587 specification. But this is a young industry. Sometimes our quest for

ry, as with the EGA boards. Other times, we reject the industry-standard benchmark tests as being unrealistic.

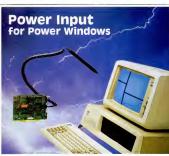
Printer speeds are an ideal example. The common measurements concern themselves only with how quickly the printhead can spew out characters. They limit themselves to horizontal motion. while vertical motion (the printer's ability to roll the paper through the carriage) actually has the greatest effect on throughput. With a little research, we found that the average business letter was a page and a half long. The PC Magazine Labs printer benchmark test is now used by printer manufacturers everywhere to gauge their products' performance. Basically, it measures the time it takes for a printer to produce a page-and-a-half letter.

SPEED ISN'T EVERYTHING But the Editor's Choice isn't necessarily the printer that cranks out the letter the fastest. As concerned as we are about performance, we're not blinded by it. As you know, we continue to heap praise on the IBM Proprinter. It has the best combination of features and performance in its price class. Recently, the IBM engineers who designed the Proprinter told us that our printer "blockbuster" issues from 1984 and 1985 were the standard reference from which they selected the features and measured the performance against which the Proprinter would have to compete. They targeted well. Not only did the Proprinter garner top honors in our last printer roundup, but we haven't seen anything to knock it off its perch in the intervening year.

The kind of rapport that we establish with manufacturers before and during testing is unusual for a computer magazine. Our interest, after all, is not to put down bad products but to ensure that the ones you buy are the best available. To that end, if we can help the manufacturer build a better product, we will. You benefit. We benefit. The industry benefits. We give away our benchmark test disk

at trade shows, causing giant, aisle-clogging jams. The programs are on many bulletin boards and can be found in information center software libraries nationwide

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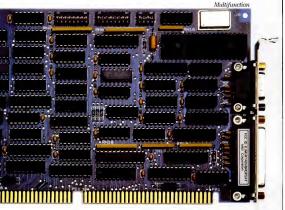
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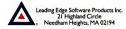
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IBM PRODUCT CENTERS: THE FINAL ANALYSIS



With this issue, John C. Dvorak begins a new column, bringing a new perspective on the PC arena. And look for his Inside Track into the computer industry on the following page.

was disappointed to see little or no analysis in the press of the recent sale of the IBM Product Centers to Nynex. We heard variously that IBM wasn't making money on the Centers, might have broken even, might have made a little money, or who knows what? What does this bode for retailers (or the industry) in general? If IBM can't made it, then who can?

Well, it seems that IBM never intended to make money on the Centers. Corporate insiders tell me that the IBM Product Centers were expendable less than a year after the first store was opened in Philadelphia in 1980. By 1981, IBM was already seeking to either sell the individual stores to employees or to franchise them.

The stores were developed as a direct resulu of IBM's no Javylf policy and the re-organization (or, rather, climination) of its Office Products Division (OPD). "IBM had a lot of typewrife eastern all over the product Centers, then phase them out of the company, since none of these guys knew much about selling computers," one observer told me. The new emphasis for office sales would not be in retailing through storefronts, but considered the company control of the product Centers (the product Centers) and the company of the co

Since this new direction meant a lot of office sales employees would eventually be jobless, IBM prayed that some employees might want to buy a store.

As OPD was being dissolved, IBM hired a large market research firm to create a slide show presentation to demonstrate the benefits of entrepreneurial activity to these employees and tell them about opportunities in the real world. The underlying suggestion: Get a real job? Then some occuritives got cold feet, thinking that someone might misinterpret the blunt sides show. Perhaps Blum dien't want to be suggest that an employee want wanted. So the presentation was never given, and BM went athead with the Product Centers. We have been supported to the product of the side of the product of the support of the product of the side of the product of the support of the support of the side of the support of the support of the support of the side of the support of

THE LONG GOODBYE It never happened. The typewriter salesmen weren't the kind of guys who wanted to be in business for themselves. They liked the steady paycheck and the prestige of being an IBMer. IBM tried for 5 years to get rid of the Product Center stores because they interfered with its VADIVAR sales, Compu-

an IBM dealership.

■ IBM Product Centers were developed as a direct result of IBM's no-layoff policy and the reorganization of its

Office Products Division.

terLand sales, and its own telemarketing. Meanwhile, no one could figure out why anyone would buy from the stores. The Product Centers weren't allowed to discount or to wheel and deal, Still, some of them racked up over \$4 million in annual sales. Not shabby at full margins, no matter what the rent. It's amazing how much

magic there is in the three letters, IBM.
Finally, IBM sold the 84 stores (actually, 81 stores and 3 locations that have to be
moved) to Nynex, which had seen other
Bell holding companies (like Pacific Telesis) making waves, so it got the nerve to
expand in a big way.

IBM surprised its Adama headquarters with a same-day announcement. After all, the company seemed sincerely interested in retailing. The last store was just opened in Torrance, Culifornia, a few months previously, in August 1985. "The employees in Adama were steamed up by the suddenness of the sale," said an IBMer at the Atlanta headquarters.

Meanwhile, if you carefully read BMY announcements about the side of the stores, you'll find heavy emphasis on the fate of employees. IBM Cop i have help and the fate of employees. IBM Cop is estained and will probably have to be scattered around the country. Talk about loyalty! This will leave Nynes up a creek. There is a genuine shortage of qualified computer store floor persons.

After all is said and done, storefront retailing and IBM go their separate ways. It was an exercise in futility: no reason to panic, and nothing to contemplate.

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JOHN C. DVORAK

INSIDE TRACK

With Boeing's new entry, the 3-D spreadsheet comes of age. And an amazing name generator is introduced.

ook for a flurry of interest in 3-D spreadsheets over the next 6 months or so. It's probably the only interesting thing happening in the moribund spreadsheet business.

Three-dimensional spreadsheets aren't new. There have been a few notable versions of the idea over the last few years. (The most recent is Paperback Software's VP Planner.) But the market hasn't shown much interest yet, since many users are still trying to cope with the two-dimensional concept.

If you don't understand 3-D spreadsheets, think of a 2-D spreadsheet as a 3by-5 card containing data written in cells. In 3-D you have a stack of such cards. In a 3-D spreadsheet model, each imaginary card can access data from every other card. I think the best use is in a corporation for departmental budgeting. Each department would have a standard spreadsheet template for its budget. The division head could then load each department budget into a 3-D model and analyze numbers like crazy. As it's done now, each department makes a budget, then the totals are reentered into a divisional spreadsheet.

Anyway, expect renewed interest because of a product from Boeing Computer Services, up in Seattle. Boeing developed, in-house, a whiz-bang Lotus lookalike spreadsheet that uses virtualmemory techniques and works in three dimensions. It's definitely a superset of the Lotus spreadsheet. I prefer it to VP Planner, which is also 3-D but not as comfortable to use-don't ask me why. The Boeing spreadsheet uses no overlays, so it's big. Real big! It's 450K bytes and obviously requires a hard disk. I used it effortlessly. It can make a spreadsheet that is 64 megabytes large, too! Talk about an auditor's nightmare.

I visited Boeing to get a gander at this thing. The product is tentatively called BoeingCalc, an ugly name. Insiders are trying to get it changed to 747-the Power Spreadsheet, since 747 connotes big, powerful, reliable, and fast. The price is hovering around \$399. It's written in a Boeing version of Pascal.

While this thing is hot, the company is not. I found Boeing to be typical of old industrial companies. Spell it S-T-O-D-G-Y. When I visited the 747 plant, one of the largest buildings in the world, I was shocked to find cheap Woolworth-type oil paintings in the main lobby. There were a couple of cheap couches there too, the kind you see on the porch of a shack in Appalachia-no kidding! Are these guys out of it or what? I'm used to Silicon Valley elegance, Spell it C-H-R-O-M-E. My suggestion: spend a few bucks. Grow some taste.

The personnel were like the furnishings. I think the main topic of conversation is whether quadraphonic sound is a viable alternative to stereo. A status symbol is a Benrus watch with a twist-o-flex band. The big controversy is whether to ban rock and roll because some kid was knifed recently at a Judas Priest concert. It's pathetic.

So it remains to be seen whether Boeing can sell microcomputer software from an old-fashioned perspective in a modern world. If it can, then watch Lotus do it one better. Genuinely Interesting Software

Dept. Once in a while you hear about a program that sounds comy or mickey mouse or user group city. You don't take it seriously. That was my initial take when I first heard about a software product called Namer. But once I used the thing, my mind changed-fast. I was astonished by its capabilities, and I can understand why many advertising agencies (including J. Walter Thompson) have been playing with it. It generates product names, slogans, kids' names, and other

great names! What it does best is come up with weird product names or intriguing company names or names for evil science fiction characters.

You select from a connotation menu. You can connote hi-tech, low-tech, oldfashioned, spiritual, stuff like that. You nick a counle of connotations to get your names. Its database of plain words, prefixes, suffixes, and Latin roots is tremendous. The program puts a word together

from pieces to create a new word. When I used it to create a high-tech name combined with devious connotations. I got product and company names like NoneStar, Neuroclud, Clamotech, Plegicene, Dynalust, Compuleo. Polemaquant, and Photigon. There were hundreds more! "Yes, the new Venomaprobe from Toxidyne Corp. is the answer to the population explosion. A new Plegicene era will be upon us."

Combining high-tech with spiritual attributes, I got names like Hydrichron, Xenosoft, Octamind, AsteraCalc, and Alphangel. These all sounded like cheap pulp science fiction names. "The Alphangels attacked us from the planet Hydrichron, Captain! What are we going to do? Dare we launch the Octamind?"

Other combinations of this and that produced Flickadot, Easibound, Wellipun, Joycross, Slimapop (vum!), Blastoglow, and Cretobene. You can make up your own jokes for these names. Dvnamite software! While Namer isn't cheap at \$235, it's a must for the creative types out there. The company offers a 2week money-back guarantee. Namer is available from Salinon (which must have used its own product and then selected the wrong option to get that name) Corporation, 7430 Greenville Ave., Dallas, TX 75231. Phone them at (214) 692-9091.

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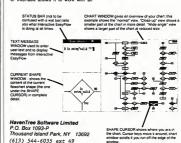
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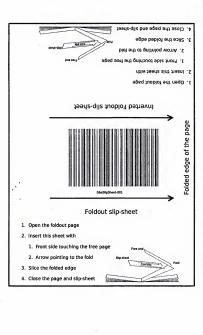
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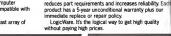
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KITCHEN-TABLE ENTREPRENEURS REVISITED



Two years ago, Norton analyzed the businesses of some of his colleagues and predicted their prospects for success. Now he tells what happened to them.

the most popular series of columns I've ever done was the one devoted to the subject of "kitchen table" software entrepreneurs. The last column in that series ("Lessons from Software Veterans," PC Magazine, Volume 3 Number 13), published 2 years ago, told the tale of five of my colleagues in the software business. I analyzed what was smart and dumb (in my opinion) about what they were doing and guessed at the prospects for their continued success. It's time now for us to see what has happened to the people I code-named Ms. Smirk, the Boxer, the Generals, Mr. Easy, and Dutch Treat. (Now, as before, I'm disguising the players a little, but the key events that I've described are real.)

FORTUNE SMILES Two years ago, I, reported that Ms. Smirk was doing very well in the software game, even though I felt she had made some serious mistakes: she'd failed to branch out from her single-product, and she'd passed up some opportunities to raise her prices (and profits) when it would have been easy to do so. Then, there was the question of how long her monopoly would last.

The years have been kind to Ms. Smitk. Her sales kept growing, faster than her regarded the reasons. Competitors have appeared, but not one has put a dent in her sales a clever—and impossible to duplicate—sales strategy has defended her recate—sales strategy has defended her product. (One of the software giants tried on to mittable her special sales strategy but got on owhere.) So far, so good. Now Ms. Smitk is trying to break out of the one-

product mold. New software may make her richer (her business sounder and her fortune safer), or it may piddle away the success she's had. For most of the group, the last 2 years have seen a clear rise or fall; for Ms. Smirk, the last 2 years have been a spectacular success, but she's beginning a risky new chapter of her tale.

A BIG FISH IN A SMALL POND. All of betse software enterpreneurs tried to succeed by having a product "big" enough to clade the attention of the major software between the county to clade the attention of the major software to the control of the county to the clade the attention of the major software to the control that and Lotus). The Boxer followed this plan to perfection, with programs unlikely to attract competition. The Boxer's ad campaign was just right (not so expensive as to throw profits away but not so small as to miss attracting his customers) of the customers of the



er than my one-product examples.

My admiration for the Boxer continues:

y yaannatuli or lie stocker Contingers, y years have shown the wistdom of his ways. He avoided a real pitfall getting is, and then going broke. Now he has more software (and hardware to go with it) and, as near as I can tell. his story perfectly exemptifies what a kitchen-table software entrepreneur should do; and he's a perfect Southern gentleman to boot. His is a tale that appears to end happily ever after.

TRAMPLED BY THE ELEPHANT TWO years ago, the Generals seemed the best of my group. They had one highly successful software product that was the accepted leader of its type, and they had revery well bufflador their competition. They had a sound business strategy for either product price it high so that the profits would pay for an expensive four-color and campaign to increase sales and put a high cost barrier in front of any potential bufflators the product lene, build up their company, sell it, and live happily over after on the roofs.

However, it didn't work out that way, for one thing, the other products never materialized. For another, a new software entrepreneur ("It call him Rogue Elephand) appeared from out of nowhere for some place like Quebec) and change the rules of the game, trampling the Generals along the way. The Elephant, having had great success selling other kinds of software, seems to have also taken the Generals' specially from them. My guess is that the Western and a specially from them, My guess is that the Western and State of the Court.— The Victims Roy Court of the Court.— The Victims Roy Court of the Court.— The Victims Roy Court of the Victims Roy Court of the Court.— The Victims Roy Court of t

■ PETER NORTON

both of their own errors (staving a oneproduct company too long and not banking their profits) and of the Elephant's unexpected success. Generally, once you're accepted as the leader in one type of software

(as the Generals were), you're in a relatively secure position; but that wasn't true in this case. We'll see in a year whether I'm right in thinking that their enterprise is terminally ill.

A SLOW DEATH Mr. Easy was having it rough the last time we saw him. His programs didn't have broad enough appeal. and he wasn't reaching his potential customers with the small, but (for him) expensive, display ads he was using. Two years ago, he appeared to have found his salvation in the discovery that he and his customers could best find each other through ads and listings in program catalogs rather

than in magazines such as PC Magazine. But that didn't seem to work out. Mr. Easy has disappeared from sight, his software business, as far as I know, out of business. In the early days of the PC, there were hundreds like him, who had hope but no success. Mr. Easy lasted longer than many, which is why I'd found his example worth including in my group. It turned out, though, that he just took a little longer to die than most. Mr. Fasy started out like Ms. Smirk, with a very low-budget, kitchen-table operation. Fortune smiled on her. but not him. The lesson there is that the game is worth playing, but don't bet your life savings on it. For every Smirk who wins, there're dozens of Easys who don't.

WEIRD AND WONDERFUL PROD-UCTS On the whole, my original predictions about this group of software vendors turned out to be as accurate as such predictions can be. But my predictions about the last of my original group, a wild man I code-named Dutch Treat, were the least accurate. (There's now a PC software company with the name Dutch Treat, but, of course, I'm not referring to it here.) Back then, I criticized Treat for being confused about whether he was in the hardware or software business and for blowing far too much money on flashy advertising. At the time. Treat seemed to be headed for disaster

But things turned out quite differently. Wild-man Treat is truly as chaotic a businessman as I thought he was (and I know he'd agree with me), but his talents are so exotic and his products (still a mix of hardware and software) are so weird and wonderful that he continues to have a strong following. The bizarre nature of his products has proven to be his key strength, and not the weakness that I narrow-mindedly thought. In my mind, the PC market was all about Chevys, Hondas, and Porsches.



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PETER NORTON

Treat found that there's a real market for hot-rod supplies, drag racing, and demolition derbies. Although Treat isn't in the PC mainstream (or in the big-time profits), his business is very robust and doing far better than I predicted.

NEW PLAYERS A few new folks in the small software game deserve to be added to my original gang of five. I've already mentioned the Rogue Elephant. In the 2 years since this series of columns began, the Elephant has gone from nowhere to being a major player in the software game, completely out of the league of the folks I'm discussing here.

The String Bean was one of the very first people to board the PC software bandwagon. Bean tried a totally different tactic than the rest of my group. Although Bean, like the others, began as a one-man operation, he went after a major-league market, with a major application, something like databases or word processors. Needless to say, the big guys have been running roughshod over Bean's operation, and he's not making as much money as he should, although his gross revenues are higher than anyone else's in the group. And he is having a lot of fun and getting a lot of glory, at least. Bean is a good example of the point that small software entrepreneurs should be hunting small game; better to bag an antelope than get gored trying to bag a rhinoceros.

In contrast, perhaps the most glorious example of my sample of small software businesses is Zipper, who tried selling software the user-supported, "shareware" way. There are about a half-dozen folks that I know of having a go at this scheme; all are doing OK, some are doing well, but Zipper hit the big time.

Of all the small-company software entrepreneurs companies that I've studied. Zipper would probably make the best business-school case study because he did everything right. He knew how to reap all the benefits of smallness but used sound, professional judgment about how to run a business. In particular, he avoided wasting money by not chasing glory: he didn't try to grow too big or too fast.

In a year or two, I'll take another look at these software veterans and let you know how they're doing.

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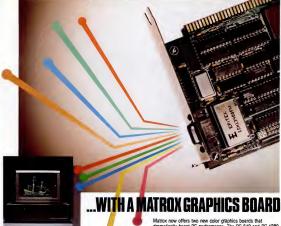
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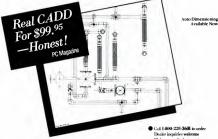
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A BETTER WAY TO SUPPORT SOFTWARE



An enterprising new company is proving the viability of third-party software support. If the idea catches on, customers could face a whole different form of software support.

few columns ago (Volume 5 Number 3), I mused about the inevitable rise of third-party softwaresupport vendors and the bright prospects I see for those firms. Debbie Fain, who ran one of the indus-

try's best telephone-support operations for Samna, went out on her own recently and, as MSR Inc., is proving just how viable third-party-support businesses can be.

My column talked about the most fundamental level of third-party support: taking over responsibility for supporting a software publisher's customers directly, so that buyers of, say, XyCalc would actually be calling the third-party vendor (let's call them 3PVs) when they think they're calling XyCalc's offices for belo.

That's still a promising market, but Fain's crew, now numbering about 25, has found selling support directly to PC users an easier entry point. MSR began by cultivating the corporate

market and has scored some big clients: General Motors, for example, for which MSR supports about 500 PC users in the Southeast

RETAIL SUPPORT Now the company's also going after the onesie-twosie sales at the retail level through a deal with distributor Softsel. Soon you'll be able to buy from your corner computer store a cutesy little MSR box, styled to look like a box of floppy disks, that entitles you to 20 questions about any one product MSR supports, answered through MSR's "800" phone lines.

The tab? Just \$100 to \$125 per pro-

gram, or \$300 for all the packages MSR supports. You'll also get MSR's Cheatsheet booklet for the products you specify. I'm less than happy that MSR has tried to trademark that wonderfully useful term, which so many have used for so long to describe all sorts of little memory-boosters. But I like the booklets themselves very

The list of PC programs currently supported by the company is interesting, but hardly comprehensive: MS-DOS, Word-Star 2000. MultiMate. Samna. Enable. Crosstalk, WordPerfect, DisplayWrite III. dBASE III, R:base Series 5000, 1-2-3, and Symphony. Fain says more titles will be added as demanded by customers.

VENDOR SUPPORT PROBLEMS Why pay a hundred bucks or more when vendors offer the same service for free, via their own "800" lines?

First, some products simply aren't sup-



ported by their publishers. Have you ever tried to get IBM to answer a question about DisplayWrite? When you're sitting there wondering how IBM's fragmentary instructions in two of the world's more obscure and ill-organized manuals jibe with the nonresults you're getting, as you try to mail-merge with a datafile from dBASE. what do you do?

You call MSR, if you had the foresight to buy one of its little boxes, or if your employer chose to sign up for companywide support.

Even with those products that do receive phone support from their publishers, the frequent busy signals, long holds, callbacks that take days, and poorly trained staff-or even well-trained staff who aren't cross-trained to understand how their products work within the broader PC software universe-get tiring.

Wouldn't you pay five bucks a pop for a fast, authoritative answer? From people who know their company lives or dies not by its software revenues but on how happy customers are with their answers?

HITTENG CURVE BALLS Still, I'm a skeptical sort. I visited MSR's telephone boiler room in Atlanta recently and threw its support staff some curves on imaginary problems. I got good answers.

Part of the secret is that MSR invested in an IBM System 36 minicomputer and has developed a decision-tree software system loaded with common and uncommon questions and answers for the products they support. (Indeed, getting these decision trees built and into the system for

■ JIM SEYMOUR

new products is MSR's primary restraint in adding support for additional programs.)

What I liked best about the answers I got, from a kind and intelligent woman

quently went beyond those literal, insular, right-out-of-the-book responses you often get from software shops.

what I liked best about the answers I
got from a kind and intelligent woman
named Charlotte Hisson, was that they frepage breaks, the real answer had nothing to

do with what IBM calls Required Page Ends—which is where most telephonehelp people would have stopped—but in simply tossing in a few more carriage returns at the top of the document, then repaginatine. We got there quickly.

In a 1-2-3 problem about a missing WKS file, after I described how the boss had come in and worked on my PC last night, Charlotte asked me to make certain

 What I liked best about the answers I got from MSR was that frequently they went beyond those insular, right-out-of-the-

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he hadn't changed the default directory.
He had, in my hypothetical situation, and

He had, in my hypothetical situation, and once we discovered that change by /FDing, then changed back to my customary directory, there was the imaginary file.

You don't get that kind of analysis down at ComputerLand. Nor, often, on the phone with software firms' support centers.

COMPETITION MSR is certain to have serious competition soon. The market's just too large and too rich to leave to one or two or five firms. And if those new 3PVs get good

enough and cheap enough soon enough, software firms are going to face a very interesting dilemma: should they begin reommending 3PVs to their customers? Should they sever and separately price after-sale support to provide an incentive to lead customers to the 3PVs?

Or will software firms continue to embrace the two rules that seem paradoxically to lie at the heart of an innovation-driven business: "We've never done it that way," and "Why should we change? We're making money!"

Determination

Identifying The Need

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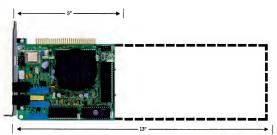
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A review of the IBM Personal Computer Family, Vol. 3, No. 1

Welcome To Read Only. Here's great news for IBM PC users.

IBM has expanded its already expansive PC product line to bring even more power and flexibility to your desktop.

In this issue alone you'll be reading

about new enhancements to the IBM PC/XT, the IBM Personal Computer AT,8 the IBM PC Kevboard. the IBM Proprinter, the Mainframe Communications Assistant and more.

And, as if that weren't enough, IBM has also found time to expand your computing horizons even more by introducing exciting new PC products. This issue of Read Only will tell you about the new IBM PC

Convertible, new 3.5" diskettes, the new IBM PC 3.5" External Diskette Drive, and two new accounting software packages.



HARDWARE NEWS

The Right Touch.

To make it easier than ever to work at an IBM PC/XT or Personal Computer AT, IBM has introduced the new IBM Enhanced Personal Computer Keyboard (shown below).

IBM redesigned its classic keyboard to better meet the needs of PC users, office system users, as well as users who communicate with larger computers.

To accomplish this, IBM included separate cursor and screen control keys, making it easier for users to dedicate the numeric keypad to numeric input when working with number-intense applications. Plus, the keypad can still be used for cursor and screen control when not in the num/lock mode.

IBM also increased the number of function keys from ten to twelve, arranged across the top of the keyboard. This gives users two additional keys for increased automatic operation.

All to enhance the productivity of those who work with words, numbers

Two Ctrl and Alt keys for ambidexor a host of other applications. trous access. Twelve Function keys in new position Isolated Escape key two additional to help reduce Enlarged Backspace and Shift keys. Function keys pro-vide added flexibilit Dedicated Function keying errors. Control keys for in host access or frequently used communications applications. Enlarged Tab and Dedicated Numeric Caps Lock keys. Pad including Enter key and four Arithmetic Function keys for easy eric input. Separate Screen Control and Cursor keys for faster, easier access. The IBM Enhanced PC Keyboard to help you be more productive, faster.

Small Wonder.

Proof positive that good things come in small packages is the new 3.5-inch diskette.

And that's big news for anyone who uses an appropriately configured IBM PC, PC/XT, Personal Computer AT and the new IBM PC Convertible.

Durable 3.5" diskettes, allow you to carry over 350 standard typed pages (720KB) in your shirt pocket. That's twice as much information as on a 5.25" (360KB) diskette, in a much more rugged, portable form.





The new 3.5" diskette stores up to twice as much (720 KB) as a 5.25" (360KB) diskette.

Now IBM PC users have the option of using programs and data in either size, and the flexibility to work with other members of the IBM PC family using 3.5" diskettes.

Translation Services.

The new IBM Personal Computer 3.5" External Diskette Drive provides a vital bridge between your IBM PC and 3.5" technology. This compact unit makes it easy for you to share

information between computers using 3.5" diskettes and 5.25" diskettes.



The new IBM PC Convertible is a J

The IBM Personal Computer 3.5" External Diskette Drive comes in two models, one for the IBM Personal Computer AT and one for the IBM PC, PC/XT or IBM PC Convertible. Information and applications can be shared* between 3.5" diskette

drive machines and an IBM PC running DOS 3.2 with the IBM Personal Computer 3.5" External

Diskette Drive attached.

Transferring files and programs between 3.5" and 5.25" diskettes is as easy as making a backup copy of a diskette. So, you can very quickly have a "database to go" for your IBM PC Convertible. Or, a week's worth of sales call information in a ready-to-use form for your secretary when you return.

Print Evolution

The new IBM Proprinter XL is especially designed to make life easier for those who work with accounting applications. Its wide carriage design and switchable printing speeds of up to 200cps are perfectly suited for spreadsheet applications.

The IBM Proprinter XL also features an easy-to-use front operator panel that lets you choose from the XL's extensive menu of features, even if you have little or no programming skills.

Plus, the new Proprinter XL offers a long list of standard, labor-saving features to make many printing jobs easier: easy printing of single sheets and envelopes without removing your

> continuous forms paper, power-assisted paper

loading, all-points-addressable graphics capabilities, near-letter-quality printing (40cps), and emphasized text printing (100cps). Plus, you can set the printer in double high, double wide or emphasized print through the operator panel or through software.

Power To Go. The new IBM PC Convertible can

play two powerful roles in any businessperson's life.

In the office, with an optional IBM PC monochrome or color display and adapter, the PC Convertible fills the bill as a space-saving desktop PC.

But when you're ready to hit the road or runway, just attach the high quality. 80-column x 25-line detachable LCD display, and the PC Convertible is ready to travel, too.

Weighing in at a scant 12 pounds, the IBM PC Convertible delivers full-size PC performance in a portable computer with heavyweight features including:

A full-function keyboard with fullsize keys and the same center-tocenter key spacing as a standard IBM PC keyboard. A fast, very efficient 80C88 micro-

processor with up to 10 hours of non-stop computing power between battery recharges (with average use). Up to 512KB of user storage

(through 128KB expansion cards from a standard 256KB). Dual 3.5" diskette drives supporting

720KB capacity 3.5" diskettes. Additional IBM PC Convertible

features help ensure that work done on the road doesn't get lost in transit.







These optional features include: An internal modem feature to let you communicate with other computers simply by plugging the PC Convertible into any standard

modular phone outlet. The IBM PC Convertible Printer for system battery powered, near-letterquality printing anywhere.

Plus, the IBM PC Convertible can come with a helpful set of programs to get you up and running on the road to enhanced productivity. Fast,

Planned For Growth.

It's a classic case of a very good thing that just keeps getting better. IBM has now introduced the enhanced PC/XT product family: increased flexibility in storage. memory and option configuration for maximum productivity today, and



The new IBM PC/XT-enhanced power and flexibility for today. And tomorrow.

plenty of room to expand as your business does.

The XT is now available with a 20megabyte hard file that can store up to 10,000 pages of information. There's also an easy, low cost way to increase memory to a full 640KB on the system board without tving up valuable expansion slots. And the XT now has 3.5" diskette capability, utilizing the new IBM Personal Computer 3.5" External Diskette Drive.

Plus, full IBM PC compatibility means that no matter which XT model you choose, you can benefit from the extensive IBM Personal Computer

software library. The new IBM PC/XTs, because one size should not have to fit all.

Power Play

If you thought you'd seen all the IBM Personal Computer AT has to offer, think again. Twice.

IBM has increased processor speed in two new models of the IBM Personal Computer AT by an impressive 33% (from 6mhz to 8mhz). So, they're sure to become your fast friends if you work with large spreadsheets and volumes of data.

The new models offer a standard 30MB hard file and the option to add an additional 20MB or 30MB hard file. That's a grand total of 60MB, or approximately 30,000 pages of words and numbers.

These two newcomers are born communicators: Sharing files with other PCs from a variety of popular software programs. Working as a server for data storage and file processing in an IBM PC LAN running the IBM PC Local Area Network program. Utilizing IBM TopView™ and one of the IBM PC 3270 Emulation Programs to access mainframe information and to execute PC DOS and mainframe applications concurrently.

And the best news of all is that you can get all this increased

power without an increased price.





Now the IBM Personal Computer AT offers a choice of hard files to meet your storage needs.



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Meet Your New Assistant.

Keeping the books for a small business is a very big job. So, IBM thought you could use a friendly. versatile, highly skilled assistant. The new IBM Accounting Assistant Series

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The IBM Accounting Assistant Series includes six individual editions: General Accounting. Accounts Payable, Accounts Receivahle and Billing, Payroll, Inventory



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Plus, thanks to the IBM Accounting Assistant Series' user-friendly attributes and easy-to-follow instructions, you can start profiting from your system from day one.

High-Powered Advice.

Perhaps your business has progressed past the need for basic accounting software. Then you should consider getting powerful, sophisticated help: the IBM Business Advisor

IBM Business Advisor PC accounting software takes integrated software to a new level of sophistication and ease-of-use.

Business Advisor's seamless architecture allows functions from each of its modules to play together. Passage back and forth among the General Accounting, Accounts Payable, Accounts Receivable, Payroll, Inventory Control, Order Entry and other applications is intuitive. Menus guide you easily from one task to another.

And when you make a change anywhere, consider it made everywhere it applies. Automatically, through Business Advisor's real-time posting feature.

This Business Advisor speaks your language, too. It uses business language instead of accounting language, and has over 80 easily customized financial report formats built in. And you don't have to keep this all to yourself, because in an IBM LAN different people at different PCs can work on the same file at the

And you always go further when everyone is working together.



EWS"BRIEFS

The 3270 Emulation Programs, Entry Level, Version 2 and Version 3, give you an easy and inexpensive way to attach your IBM PC to your host computer.

Working at your IBM PC, standalone or in an IBM LAV, you can now utilize the local power and userfriendly attributes of your PC for DOS applications, plus have access to the vast memory, number-erunching capacities and other productivityenhancing capabilities of your host computer.

The Entry Level product offers up to 40% faster file transfer between your



IBM PC 3270 Emulation Products can put your IBM PC or IBM LAN in touch with the big time.

PC and host computer. A "Hot Key" for easy switching between host and PC applications. Keyboard remapping so you can always work in a familiar keyboard format. And much more.

Versions 2 and 3 can provide an economical gateway which lets you share the wealth of host knowledge with the members of your IBM PC Network or Token-Ring Network.

Versions 2 and 3 support the new PC DOS 3.2, 3.5" media, the IBM Local Area Network program 1.10, a host of printers and the TopView 1.1 interface, for multitasking and windowing capabilities.

All of which adds up to added productivity for you and everyone on your IBM Local Area Network or token ring.

To find out more about the entire family of 3270 PC Emulation
Programs, as well as a wide range of other IBM connectivity hardware and software, watch for the next
Read Only.

Mainframe Communications Assistant enhancements include 3.5" media support and increased IBM PC family communications capabilities.

The IBM PC Voice Communications Option speaks for itself. This multifunction adapter card can allow your IBM PC to recognize and respond to voice commands, speak test that appears on the screen, initiate and receive/record/playback phone calls, provide remote, tore push button phone access to your PC (and host), and transmit voice and data simultaneously.

For more information on any of the Personal Computer products discussed in this issue of Rend Only, see your Authorized IBM Personal Computer Dealer, Or, call 800-447-4700. In Alaska call 800-447-0890.

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Corporate Maneuver.

In the high-pressure corporate environment, every move counts. It's no wonder, then, that many corporate PC users are reaching for WordPerfect for powerful business word processing.

Reaching the top.

WordPerfect is now the best-selling word processor for the IBM PC, according to market research firm InfoCorp. And customers like Ford, Chrysler and TRW are leading the way.

Meeting user needs.

But WordPerfect's climb to the top was no overnight success story. For the past three years, user feedback has been applied to each new version of WordPerfect, pushing it closer and closer to perfection.

The result is WordPerfect 4.1, a word processor with unsurpassed business features for the IBM PC and compatibles. Features like an elegant thesaurus, a 115,000-word spelling dictionary, math capabilities, columns displayed side-by-side on screen, windows, line drawing, paragraph numbering, and extensive printer support. Make your move.

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Reason 3: Maximized Slot Usage

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Reason 4: Compatibility

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Reason 5: Price

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BECAUSE TIME IS THE ULTIMATE BOTTOM LINE.

NETWORKING: A ROCKY ROAD



For small businesses, networks are definitely the wave of the future—the distant future, For now, sharing resources is often a fast track to frustration.

The newly promoted director of a professional association [greatly respect is about to drag her five-person office into the computer age. It's ruly a start-from-scratch job: in the current steam-age setup, an electric typewrite qualifies as a major luxury, and the only microprocessors may be in the employees' wristwatches.

Ideally, my friend the director will set up a database of membership records and use it as a resource for mailings, accounting, financial projections, and anything else the can think of. What she really needs, say the expects, is a local near network, and the expects, is a local near network of the expects of PCA, and a couple of PCA, as couple of PCA, and a couple of printers. For now she'll share data on high-density from the expect of PCA and a couple of printers. For now she'll share data on high-density for a couple of Bernoulli Boxes. She is undoubtedly making the right has printed for a couple of Bernoulli Boxes. She is undoubtedly making the right

SNOOKERED To hear some people tell it, sharing computer resources is absolutely be only way for a small business to go—especially if it hopes ever to become a big business. To hear those who've been snookered by such claims, however, sharing resources is more often than not a high-speed road to frustration, pain, and ruin. Even the nomenclature is confusing. Quick: is IBM's PC Network the Token Ring Network by another name?

You need a guide in order to avoid such stumbling blocks before you take the long and winding ride down the shared-resource road. Unfortunately, the guide is called a "consultant," and the meter keeps running and running even if you never quite get to your destination. Consultants for shared-resource systems because that's what they cut their teeth on in the mainframe and minicrosputer works and the consultant is quite often the only one with a thum bin the leaky dise along the highway. In the Holland of yore, the kid performed his services for free, American consultants digits tend to be somewhat

So it's no wonder so many small operations keep stalling when it comes to hooking their PCs together. After all, in corporations and biggish small businesses, data-processing experts are on-staff or oncall to get systems running and take care of the inevitable problems. In the rest of the world, the microcomputer user generally sest up and maintainist the system without benefit of an on-site professional. That makes noncoporate users rather fussy; it



also demands that they understand a fair amount about what's going on. Moreover, noncorporate PC users detest paying for support; their budget for this item is often limited to the cost of phone calls to dealers and friends.

Wors, he isn't exactly overjoyed when he discovers he may have to shave the processing speed of his machine with half a dozen other folks. "Adequate response time" in the mainframe world is "too damned long" in the land of the single-user AT. The choices often boil down to the working with desirable software slowed to a crawl or using mainframe-type stuff that's painfully out of date.

There are plenty of other rocks in the road to shared resources. Who's going to plan the physical cabling? Who's actually going to be the one to run the cables through the walls? Who's going to mind the printer when the guy across the hall from it decides to run a big job's Zetting up

a network's a whole lot more complicated | A TRAGEDY IN THE MAKING Anythan running down to the local Computer-Land, pointing to a couple of boxes of hardware and software, and running the Visa card through the machine.

one who remembers the original PC learning experience is bound to view the new complex situation with a certain cynicism. Now there's system, file, and record integrity to worry about. Backup is a problem even with standalones; what are you in for when you've got to back up everybody's work, all at once? Losing your spreadsheet of projections for next year isn't tragic; losing your company's entire financial and customer database is a subject fit for a

Sophocles.

Where do you turn when things go wrong? The original consultant is probably the one who got you into this mess in the first place, and your friends can't help. A second opinion may cost thousands of simoleons. And things will go wrong. When the system goes down for a day, the whole company will get paid for standing around in Bob Hope emulation mode.

The worst part is that the level of integration the small-business user really wants probably isn't available and may not be for a good long while. The dream is a program that dynamically updates everything from financial projections to mailing lists to monthly books with each new piece of data entered. The reality is a series of less-than-elegant data-massage sessions that can be performed faster on single-user machines than on the hobbled octopi of shared resources.

Shared systems may be the wave of the future, but for small businesses that future is more distant than a lot of people think. It's likely to take 80386-based machines. an operating system that can fully access their capabilities and still run PC-DOS applications, and highly complex new software. Until the guy whose head is on the line (and in small operations, that head is very hard to hide) feels confident about being able to buy the thing, set it up, and keep it running all by himself, the shared system is something many small operations will rightly continue to do without.

I'll bet the complexity of shared systems is as much as anything else responsible for the success of Bernoulli Boxes. Got a database bigger than a single floppy but smaller than 20 megabytes? Stick it on the Bernoulli and walk it to the unit across the hall. Or hook up two hard-disk machines with a null-modern cable for half an hour. These may not be elegant ways to share resources, but they're safe, easy to implement, and relatively cheap. And you don't need a consultant to understand them or keep them running.



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DESIGNING THE PERFECT PC FOR THE HOME



If IBM can't create a home market for PC-DOS software, who can? The most likely candidates are Tandy and Commodore, but maybe IBM should give it another try.

The fact is, as I began to describe in my last column, IBM made it very difficult to have fun on the original PC. I don't mean the kind of fun that the guys in basements with plastic pen protectors have. I mean the kind of fun that most normal human beings find entertaining: playing games.

BM had the right idea with the PC/r, except that it designed the computer not to compete with he original PC, thus making it an unattractive choice for most people. In other words, BM's supplying the computer with color graphics and a sound chip was smart; its giving the PC/p² a toylike keyboard and limited memory and disk drives was not.

The death of the PC/F last year persuade of most manufacturers that there was no home market for a PC-DOS computer. And the lack of success for most DOS entertainment programs has persuaded soft-ware publishers, many of whom had been "humed" by publishing programs for the PC/F, that business programs are the only sure bet for IBM-compatible computers. If BM couldn't create a home market for DOS software, the publishers saked, who could?

A STAR IS INTRODUCED One manufacturer, however, wasn't put off by IBM's failure with the PCjr. In the fall of 1984, Tandy Corp. Introduced its Model 1000 personal computer, a fully compatible PC for just \$1,095. It began selling well immediately and was one of the few stars of the 1984 Christmas sales season. That was particularly nice for Tandy,

which had been having a tough time selling its other computers since IBM came into the market in 1981.

But then, last fall, Tandy began busing the computer with a color monitor (it comes with color graphics built in) for the unbaard-office of 5959. People liked that even better. And a fump thing buspened to the color of the col

Thus, Tandy managed to show that there is indeed a home market for DOS programs, as long as there's a computer designed and priced to appeal to consumers. Tandy's success with the Model 1000, of course, begs the next question. Since



Tandy sells its computers only through its own Radio Shack stores and Tandy Computer Centers, why hasn't another company jumped into the fray with a home-oriented DOS computer to sell through independent computer dealers and mass merchants?

OPPORTUNITY KNOCKS Here's a golden opportunity for a computer company that understands consumers and is willing to take a chance on their fickleness. Here's how that company should design the perfect DOS home computer:

The very first consideration for any new home computer is price. IBM discovered that people would put up with the PCir's deficiencies if it was priced at about \$800, including color monitor. Tandy, selling a better computer, has been able to command \$999 for its machine. In other formats. Commodore still sells a lot of 64s. with great sound, OK color, and a terribly slow disk drive for about \$500. Apple sells a lot of color IIc's with a disk drive, great color, lousy sound, and 128K bytes of memory for about \$950. Given all that evidence, it's clear that the market for the perfect DOS home computer has a ceiling: the machine must be priced at less than \$1,000, preferably closer to \$900.

Within that price constraint, you can actually design a really neat machine. First, you need a basic 256k-byte PC with a floppy disk drive (including at least three bus slots). If you set out to build it inexpensively (using surface-mount manufacturing, for instance, plus some very-large-scale integration to reduce the number of

■ STEWART ALSOP

chips), an aggressive manufacturer can probably deliver the basic machine for roughly \$500.

That leaves about \$450 for the rest of the computer. For that money, you can

easily build in color graphics, sound, and a few special features. Building in standard color graphics, as Tandy (and others) has already done, is a safe bet. But enhanced graphics would be even better. And Paradisc Systems has a single chip that could be easily mounted on the motherboard and that delivers both standard and enhanced graphics. I don't know much about sound hope, I don't know much about sound hope, However, I imagine that someone have a nice four-voice chip that could also be mounted on the motherboard. Add a printer port and at least two built-in joysick ports and you've got an extraord sick ports and you've got an extraord which will be provided by the both come computer that can easily double as an examadable work-ait-home computer.

SOME LIKELY CANDIDATES So who's likely to develop such a computer? Two companies are perfectly positioned to introduce a home-oriented DOS computer that would be sold through independent dealers.

Most obvious is Commodore, which is already doing quite well selling include a sellar discourse in Europe. Commodore 46s. has the manufacturing and distribution capability to build and distribution capability to build and distribution capability to build and company took a chance and pushed a computer successfully. If the company took a chance and pushed a company took a Canace and pushed as Tooys-R-Us or Sears, it could probability build enough volume to allow it to drop the nefect to about \$570.

Most interesting, though, the other company that's in a position to sell a DOS home computer is IBM itself. Unlike its situation 3 years ago, when it announced the PCjr, IBM's basic PC, a computer that hasn't been reengineered in 5 years, is now facing stiff competition from overseas. Since that time, the XT has become the workhorse business machine, and business buyers are beginning to look more and more toward newer computers like the AT or possibly a computer with the 80386 processor as the future standard. That leaves the PC a sort of orphan, waiting to be intelligently redesigned for a new life as a home computer.

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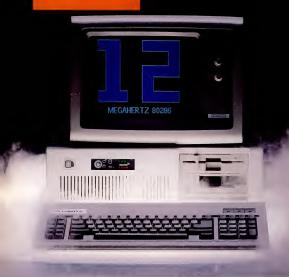
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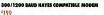






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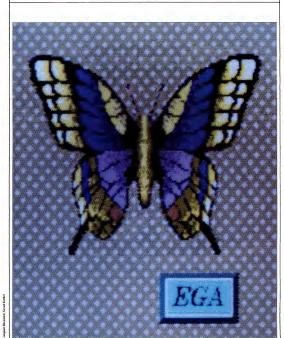








Tabout notice



The Enhanced Graphics Standard

Comes of Age

A new crop of video adapters compatible with IBM's Enhanced Graphics Adapter has turned the EGA from a nice option into the new display standard. Many of you use a PC equipped with a basic green monochrome monitoring and monochrome discount of the property of the property

hanced graphics adapter.
And therein lies the problem with displaying graphics: Everybody's got something different. Designing software with graphics that can play on whatever equipment is available is both time-consuming and distracting, since creating a display is not usually the primary objective of most software.

Last fall, something happened that

promises to allevine the industry's embarrassment of graphics standards. That something was the popularization of the enhanced graphics stadper, usually called EGA. In a matter of months, available EGA boards increased from a restricted supply of a single, fairly expensive model made by IBM to more than a dozen fully compatible models made by independent with the companies of the companies of the contraction of the contrac

IN THE BEGINNING When IBM introduced the PC in 1981, color graphics was not considered an important or even relevant aspect of business computing. In fact, computers that featured color graphics, such as the Apple II, the Radio Shack Color Computer, and the Commodore 64. were largely viewed as home computers. IBM didn't set out to build a home computer, and so it focused on producing a computer for which it believed the standard would be an 80-character by 25-line monochrome display. But IBM didn't want to completely ignore the home and educational markets, and so it offered as an option a color/graphics adapter (commonly known as CGA) that is capable of displaying four basic colors in resolutions of 640 dots by 200 lines and 320 dots by 200

The marketplace decided, as it often does, that IBM's product introductions were not sufficient. IBM's monochrome display adpater couldn't display graphical images, and IBM's color card couldn't combine color with 80-column text.

Hercules Computer Technology soon offered a partial solution: the Hercules Graphics Card, a monochrome graphics adapter that displays graphics on a standard monochrome monitor at a resolution of 720 dots by 348 lines. Several other companies tried to develop higher-resolution graphics adapters, but none was able to generate enough support from software developers to make its product a universal standard, as the Hercules card had become. As a result, by 1984 the industry was selling four different "standard" display adapters for color and monochrome text and graphics, none of which allowed you to display both graphics and text on a single high-resolution color monitor.

Meanwhile, Compact Computer Corp., improving on IBM's design for the first time (but not the last), built into its computers a combination monochrome and color/graphics adapter that could display both readable text and standard IBM graphics an Company is built-in monochrome monitor to display color graphics. Compast committees to display color graphics. Compast monitor to display color graphics. Compast monitor to display color graphics. Compast wringer if they wanted to display graphics, color, or monochrome. Compan owners had to invest in a color monitor only if they wanted color.

FINALLY, A STANDARD The dissatisfaction within the industry didn't amount to much, however, because the only com-

■ At first, customers met IBM's enhanced graphics adapter with an enhanced

yawn.

pany with the ability to crease cuiversally supported standards for IBM personal computers was IBM index and IBM was taking its sweet time. Finally, in September 1984, just a month after IBM and Pc-DoS 3.0, it sneaked in an amounced the PC-AT, the PC-Nevok, and PC-DoS 3.0, it sneaked in an amounced resional Graphics Adapters: the Enhanced Graphics Adapters and the Processional Graphics Controller (the latter, a very high resolution board suitable for the processional Graphics and suitable for an adapting the processional Craphics and suitable for an adapting the procession of the p

IBM's Enhanced Graphics Adapter is a long add-in board that can display 1-60 on at a resolution of 640 by 350 (it can display graphics witten for the doller Globel Graphics' Adapter at that adapter's lower resolutions). With its higher resolution, it can also display restable text in one or more colors. The board comes with 64K of sighty memory (random-access most display memory larndom-access most that creates a buffer for graphic images witting to be diligatively and care with switting to the switting to the switting to the switting switting to the switting to the switting switting to the switting to the switting switting to the switting switting to the switting sw much as 256K of display memory installed on a daughterboard.

At first, customers met IBM's Enhanced Graphics Adapter with an enhanced word of the several reasons. First and foremost was its high price: \$985 for a board outfitted with maximum display memory plus another \$700 for the enhanced color monitor needed to display the increased resolution and additional colors. Second, when IBM introduced the Enhanced Graphics Adapter, no software extised to take advantage of its features.

Third, and possibly most frustrating, the Enhanced Graphics Adapter is just harely compatible with the Color/Graphics Adapter. Software developers, by nature undisciplined and unrestrained, had played a number of tricks with the Color Graphics Adapter, and IBM's EOA can't deal with programs that use those tricks. In addition, the board can't display graphics written to support Hercules's monochrome eranbics.

In mid-1985, if you wanted to display high-resolution graphics but also wanted to be scrupulously comparitie with every rogram developed, you had to buy two moistors (monochrome and enhanced col or) and as many as three display adapters. The actual cost of displaying high-resolution color graphics was close to \$2,000. As a result, just a year ago, most people in the industry didn't brink IBM's Enhanced industry didn't brink IBM's Enhanced much-anticipated high-resolution color graphics standard.

In September 1985 a startup company with the odd name of Chips & Technologies announced its EGA CHIPSet, a set of 4 chips that handles the functions of 19 of IBM's proprietary chips on the Enhanced Graphics Adapter. By November. at the huge Comdex fall trade show in Las Vegas, more than half-a-dozen companies had introduced EGA-compatible boards. most priced at about \$600, that offered a standard 256K of display memory and were based on Chips & Technologies' EGA CHIPSet. At the same time, Microsoft finally released its long-awaited operating environment, Microsoft Windows (see "Operating in a New Environment," PC Magazine, Volume 5 Number 4) and emphasized that it supported the Enhanced

Graphics Adapter as the standard for imply

resolution graphics.

One indication of the breadth of support that has snrung up for enhanced graphics comes from Corporate Software, a Canton, Massachusetts, company that sells software to cornorations. Cornorate Software's list of current program versions notes that of the more than 200 software products it tracks, more than 50 now explicitly support EGA.

A SNAP DECISION Several developments from manufacturers of EGA boards have made the PC owner's decision to add high-resolution graphics much simpler.

First, the new EGA-compatible boards all offer 256K of display memory as standard; the extra memory is important for displaying complicated images rapidly and for scrolling images across the screen

smoothly and quickly. Second, the new boards have established a lower price as the norm. Where IBM's adapter cost nearly \$1,000 with a full 256K of display memory, most of the compatible brands now list for just under \$600 and a few are priced at less than \$400 (see the Summary of Features table in the accompanying article "Achieving the Standard: 12 EGA Boards"). Those prices make the extra cost of high-resolution graphics (for both adapter and monitor) about an \$800 investment, down from \$1,200 to \$1,500. Indeed, as EGA-compatible boards get less expensive, the small difference in cost between buying CGAcompatible and EGA-compatible boardand-monitor combinations is likely to render the CGA virtually obsolete.

Third, several of the board makers have taken the extra step of building in separate and explicit support of both IBM color graphics and Hercules monochrome graphics. Some also include other features, such as a printer port. At the same time, some monitor manufacturers have built monitors, like NEC's MultiSync, that can operate at different frequencies and display color graphics at different resolutions with different adapters without forcing you to switch monitors.

While it is still difficult to remember all of the possible configurations, it is now possible to buy only one board and one monitor, on which you can run any piece of software-regardless of the type of

A RES BY ANY OTHER NAME

he old IBM Color/Graphics Adapter supported graphics in "medium resolution" (320 dots by 200 lines) and "high resolution" (640 dots by 200 lines). The CGA documentation also indicated that an unsupported "low-resolution" mode (160 dots by 200 lines) was

also available Calling your best resolution "high" is only natural, but it doesn't leave much room for expansion. With the EGA board, the 640 by 350 resolution was called "enhanced," but what comes after that, "superenhanced"?

Let's start over. Let's agree that video -Charles Petzold

graphics or text it supports-without having to remove the cover of your system unit to reset switches. You still need to remember to reset switches or use different CONFIG.SYS files for some combinations. But even that requirement may disappear: the Paradise Systems EGA board. released too late to meet our deadline, is supposed to be able to switch from one display to another automatically.

You still need to be careful about ungrading to high-resolution color graphics if you rely on software that supports only the IBM color graphics standard. You will need either to buy an adapter that can coexist with your present color adapter or replace yours with a multimode card, so that the CGA emulation is capable of running your software. You will probably also need to invest in a multifrequency monitor, unless you want to stack your new monitor on top of the old one.

HIGHER STANDARDS For all the glowing praise of the EGA, nearly everyone in the industry agrees that the EGA standard is merely a stopping point on the way to something better. There is considerable disagreement about what that better thing is, although there are a few indications now of future directions

Future graphics standards must improve on the EGA with higher resolution, faster displays, and additional enhancements. This spring, the industry was rife adapters are going to get better and better and that, in the broad scheme of things, the EGA will probably find its proper niche as an adequate medium-resolution video adapter. PC Magazine therefore proposes the following changes in ter-

mulology to	in in grapine	s contags.
Resolution	Old Term	New Term
640 x 350	enhanced	medium res
640 x 200	high res	low res
320 x 200	medium res	very low res
160 v 200	low ree	no rec

by 1,024.

with rumors that IBM would replace its existing EGA board with one that would be less expensive, would include 256K of display RAM, and might offer up to 400 lines. of vertical resolution. These enhancements would be an improvement but would not represent a completely new standard, as the EGA did. The next standard will have to offer significantly better resolution, probably in the range of 1,024

The other improvement that would justify a new standard would be the speed of display. Even an EGA display takes a significant amount of time to redraw a complicated graphic. One technology that promises to improve the speed of graphics displays is the graphics coprocessor. Like the 8087 and 80287 math coprocessors already available for PCs, graphics coprocessors will take some of the load off the main processor. Graphics routines and main logic routines can then be processed faster. Texas Instruments and Intel have already announced graphics coprocessors: both should show up on add-in video boards by the end of 1986.

Whether the industry continues to offer competing and incompatible designs or moves toward a single standard, at least now you can get both text and graphics on a single high-resolution screen display. And you can be pretty sure that you won't have to replace your graphics hardware or software for another 18 to 24 months.



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With other EGA cards you have to pay extra for options like 256K screen memory and a parallel printer port. With the Enhancer these features are standard and there are no extras to buy.

11 Display Modes

There's 16 colors from a palette of 64 in 640x350 resolution. Text EGMODE menu-driven software is displayed in readable 8x14 character format in text mode. And the Enhancer's monochrome mode can support monochrome graphics on a monochrome monitor. In addition to 6 EGA modes and a monochrome mode, there's 4 color modes.

Software Switched

The Enhancer comes with that lets you change display modes, even monitors, without opening your chassis, with the push of a button. Useful help windows take all the mystery out of each possible display mode.

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Achieving The Standard: 12 FGA **Boards**

Suddenly, EGA boards are everywhere. They use several different approaches to achieve similar results, namely brilliant colors and crisp text. The biggest difference: price. When IBM announced the Enhanced Graphics Adapter (EGA) in September 1984, it was merely a high-priced video alterna-

high-priced video alternative for the PC, XT, and AT. Now, almost 2 years later, the EGA is a standard, as solid and as well-defined a standard as the IBM PC itraff

IBM did not make the EGA a standard; is imply provided the model. Eleven other companies standardized the EGA by bringing their own IBM-compatible enhanced graphics boards to the market. These EGA boards are no longer meter the staff of press releases and renative amountments. Have a real products and they are reviewed grip there. Nor it is this other major manufacturers missed the other major manufacturers missed the other major manufacturers missed to other major manufacturers missed manufacturers and the staff of the

More important than any other company in making the EGA a standard has been Chips and Technologies, whose exceptionally well-designed Enhanced Graphics CHIPSet is used in 10 of the 12 boards covered in these reviews. Even some companies that started out attempting to develop their own EGA-compatible circuits have found the Chips and Technologies price-\$84,50 each in lots of 100-hard to ignore. At this point, a CHIPSet-based EGA board looks more like the EGA archetype than IBM's own board does. (At PC Magazine's second annual Awards for Technical Excellence in April, Chips and Technologies' Edward Hutchins, Shvam K. Nagrani, and Yi-Hsien Hao were honored for their contributions to the EGA CHIPSet. See "The Envelope, Please" in

This sudden avalanche of EGA boards probably heralds universal software support for the EGA standard. While large software companies will continue to support a variety of video adapters, those that are not able to support more than one will choose to support the EGA if their products involve graphics. Many publishers have taken the plunge already, and we can at to can the ECA's 16 colors in

640-dot by 350-line resolution in graphics applications regularly.

From a purely technical perspective, the EGA standard is neither particularly innovative nor the final word in graphics cards. The IBM EGA has been called the minimum acceptable video adapter for IBM PC use. For most PC users, however. an EGA-standard board is now the hest choice for a video adapter. The EGA is the right board and, with manufacturers other than IBM selling EGA boards, it is now available at the right price.

DEFINING THE STANDARD IBM's Enhanced Graphics Adapter supports 12 video modes. The modes available to you and how they will look on the screen depend upon the amount of memory installed on the board and the monitor you attach.

The accompanying table, "EGA

marizes the video modes the EGA supports. Attaching an IBM monochrome monitor (or equivalent) to the EGA gives you two video modes. Mode 7 duplicates the text mode on the IBM Monochrome Adapter. Mode 15 is a graphics mode. Most programs that support EGA graphics will support this graphics mode since the memory mapping is the same as in the

If you connect an EGA to an IBM

highest-resolution color mode.

Color/Graphics Display (or equivalent; see "The EGA Standard: Monitors That Measure Up," PC Magazine, Volume 5 Number 6), nine modes are available to you. Several of the modes are the same (modes 2 and 3, for instance) because the IBM Color/Graphics Adapter (CGA) provides color and black-and-white versions of some video modes for composite video monitors. The EGA does not support composite monitors. The 40-column and 80column text modes will look the same as they do with a Color/Graphics Adapter, but the screen will not flicker when it scrolls. (The flickering of the CGA is caused by software that turns off the display when updating video memory to pre-

vent video "snow." This technique is not necessary with the EGA.) In addition, you get two new graphics modes, 13 and 14, with the same resolution as 5 and 6, respectively, but with 16 colors. You'll get the best results when you

connect the EGA to an IBM Enhanced Color Display (or equivalent). All programs that use text modes will show an immediate visual improvement, Instead of the grainy 8- by 8-character box, you get a nice 14- by 8-character box, nearly as good as that of the Monochrome Adapter's.

The best graphics mode available with an Enhanced Color Display is mode 16, with a resolution of 640 × 350. With 64K of memory on the EGA, this mode supports only 4 colors; 128K of memory or more gives you 16 colors. If you use Microsoft Windows with a 64K EGA, it will use the lower-resolution mode 14. (See the sidebar "Six Views of Windows,")

The EGA video modes available to you, and how they will look on the screen, depend mostly upon the type of display used. An Enhanced Color Display (or equivalent) improves the resolution of all programs that use text modes.

MONOC	HROME DISP	LAY					
Mode	Туре	Resolution	Lines × columns	Character box	Colors	Compatibility	
7	Text	720×350	25×80	14×9	4	Monochome	
15	Graphics	640×350	25×80	14×8 -	4	adapter	
COLOR	GRAPHICS D	ISPLAY	-				
Mode	Туре	Resolution	Lines × columns	Character box	Colors	Competibility	
0&1	Text	320×200	25×40	8×8	16	Color/graphic	
283	Text	640 × 200	25 × 80	8×8	16	Color/graphic	
4&5	Graphics	320×200	25×40	8×8	4	Color/graphic	
6	Graphics	640×200	25×80	8×8	2	Color/graphic	
13	Graphics	320 × 200	25 × 40	8×8	16		
14	Graphics	640 × 200	25 × 80	8×8	16		
ENHAN	CED COLOR D	ISPLAY					
				Character			
Mode	Туре	Resolution	Lines × columns	bax	Colors	Compatibility	
081	Text	320 × 350	25×40	14×8	16	Color/graphic	
2&3	Text	640×350	25×80	14×8	16	Color/graphic	
4&5	Graphics	320×200	25×40	8×8	4	Color/graphic	
6	Graphics	640×200	25 × 80	8×8	2	Color/graphic	
13	Graphics	320 × 200	25 × 40	8×8	16		
14 16	Graphics Graphics	640 × 200 640 × 350	25 × 80 25 × 80	8×8 14×8	16 4 (w/ 64		



Hercules compatible graphics: 720x348.

Plantronics compatible graphics: 640 x 200 x 4 colors.

Introducing The Paradise Hi-Res Graphics Card. Two Upgrades For The Price Of One.

Now you can have much higher resolution than your current video card gives you. Without buying new software. Or an expensive monitor. All you need is the new Paradise Hi-Res Graphics Card.

It gives you the highest resolution possible on a standard monitor With monochrome displays, you get Hercules compatible 720 x 348 graphics. With RGB and composite displays, you get Plantronics compatible graphics: 16 colors in 320 x 200, and 4 colors in 640 x 200. That's two upgrades for the price of one.

And no matter which monitor

you choose, the Paradise Hi-Res Graphics Card gives you full com-

patibility with standard video modes.

Better yet, you can use your existing software to its best advantage.

Because Hercules and Plantronics graphics are widely supported by packages like Lotus 1-2-3, Sym-

phony, Framework, and lots more. And Paradise gives you all this, plus a parallel port. On one short card. If you'd like to know more, we'll send you full information. Including free Hi-Des software compatibility

send you full information. Including a free Hi-Res software compatibility guide. Just call (800) 527-7977, Ext. 338, toll-free. From California.

smarks: Paradise, He-Res Graphies Card Paradise Systems Inc., Lotus I-2-3, Symphony-Lotus Development Corpora shore; Financwork-Ashton-Tate, Inc. Segistered trademaric IBM-International Business Machines Corp (800) 822-2020, Ext. 338. Or check it out at the best PC dealers.





CIRCLE 384 ON READER SERVICE CARD

Attaching the EGA to an Enhanced Color Display of Defen another benefit. Al-though you'll only be defen so use fo colors at a time, those I only be can be selected from a patient of 64. The EGA also supports alternating the selection of the selected from a patient of 64. The EGA also supports alternating of the selection of the

REGISTER COMPATIBILITY On a hardware level, the EGA is programmed for a particular video mode by the contents of over 60 registers built into the box's video chips. These registers are programmed through output ports. The strings of the registers control all the timing variables (such as the number of chamiters with the content of the content of the content of the own properties of the content of the content of the displayed on a line), allow different memory mappings that duplicae the grain on acts of the Color Graphics Adapter, and weter the colors.

Taking a cue from IBM, Chips and Technologies in its Enhanced Graphics CHIPSce has divided the main functions of the EGA among four large integrated circuits. Different registers are associated with each of the four. A typical EGA board using the CHIPSc it shown in the accompanying sidebar "Anatomy of an EGA Board."

In text modes, programs need not use these registers except to do sestorie things like soft scrolling (where text on the screen scrolling up of whom by less than one character) or horizontal pel panning. However, in graphics modes, programming of the registers is nearly a necessity. Unlike in the Coofferaphics Adapter, display memory in EGA graphics modes is not mapped directly into the CPU memory. The manipulation of EGA registers gets the video data into the correct locations.

For hardware compatibility, Chips and Technologies had to duplicate most of IBM's EGA registers on its own chips so that identical programmed values cause identical results. Manufacturers of EGA boards using the CHIPSet have to wire the chips up correctly and build in some additional register compatibility. Although

HOW TO CHECK THE BIOS VERSION OF YOUR EGA BOARD

Most of the differences among BGA boards are found in the BIOS, a program encoded in a ROM chip on each EGA board. Bugs that appear in an early version of the BIOS may be corrected by the manufacturer in later versions.

Sometimes the ROM chip itself is labeled with the version number. (It's a 28pin wide chip that is usually socketed instead of soldered to the board.) If the chip is not so labeled, you can usually check the BIOS version of an EGA board using DEBUG. Here's how to do it.

Install the EGA in a PC and boot up.

Chips and Technologies provides a sample circuit design to implement a complete EGA board, most manufacturers design their own.

THE ALL-IMPORTANT BIOS Not all EGA boards that use the Chips and Technologies Enhanced Graphics CHIPSet are created equal. Beyond hardware comparising, the individual manufacturers must be considered to the control of the control o

 It initializes the EGA board by programming the registers when you first power up or reboot the PC and when a program

changes video modes.

It creates a high-level interface (through software Interrupt 10h) for other programs to use the EGA. Many of the Interrupt 10h function calls are compatible with those on the system-board BIOS for the IBM Monochrome Adapter and Color/Graphics

Adapter.

It contains the fonts used for displaying characters on the display. The Monochrome and Color/Graphics Adapters use text-mode fonts stored in a ROM on the video board, but the EGA has no on-board font. The font must be loaded from memory into the board.

Most of the differences among EGA | Load DEBUG and execute the following | DEBUG command:

D C000:0

The manufacturer's copyright information, BIOS revision number, and possibly adate will usually appear at the right side of the screen. (Don't be shocked if you see the letters "IBM" in there also.) If you don't see anything that looks readable, the copyright notice may be located later in the BIOS. Enter D a few more times until it shows up. Leave DEBUG by entering Q.—Charles Petzold

The IBM EGA's BIOS (and the BIOS's of all the other cards reviewed here) is 16K long. This is twice the size of the 8K system-board BIOS that serves for an entire PC or XT (excluding the hard-disk BIOS extension). However, the length of the EGA BIOS is a little deceptive, since over half of it is used little deceptive, since over half of it is used little servers.

rameters, and other information.

IBM's BIOS is proprietary, and although a full listing is published in the EGA's Technical Reference manual, any company that attempted to put IBM's on its own EGA boards would soon hear from IBM's lawyers. Manufacturers must therefore duplicate all the functions of IBM's BIOS without directly duplicating any of

the code. What makes this situation more interesting is the sorry state of IBM's EdNS. Recontains several bugs and undocumented quirks compounded by errors in the EGA Technical Reference manual. These problems create a different and EGA with a manufacturers. Should they attempt to correct the bugs and release an EGA with a BUS that is better than IBM's 'Or does compatibility with the IBM EGA standard mean duplectainty IBM's bugs—either ig mean duplectainty IBM's bugs—either ig duplectainty is the companion of the applications software will adult to these buss and even rely on them?

adapt to these bugs and even rely on them? In general, the latter approach has predominated. Too many programs already have become "EGA aware," and one per-

This work of art is priced less.

Beauty and intelligence

Introducing SigmaEGA!" a new high-resolution display adapter from Sigma Designs. It is a true work of art for business graphics. Crisp text, sharp graphics, brilliant colors, precise high resolution, and the broadest compatibility of any color graphics adaptor made.

Art for the masses

SigmaEGA! is uncommonly

compatible. No one drives more monitors, color and monochrome. No one can run more software programs. And no one else can display IBM Enhanced Graphics (EGA), Color Graphics (CGA), Monochrome Display and Hercules Graphics software as true to the original.

Art from science?

SigmaEGA! incorporates Sigma Designs'own pioneering CGA software emulation technique, the one that made our Color 400" the standard for ultra-high resolution color graphics. It is this technique that provides the

closest, most compatible emulation of all current display standards.

And our ingenious design lets us make SigmaEGA! very small, very reliable, and exceptionally affordable. And every SigmaEGA! includes PC Paintbrush for free-form imaging.

For a private showing of SigmaEGA! call 408/435-1480 or see your local Sigma Designs dealer. Sigma Designs

San Jose, CA 95j31 SigmaEGA! Functional. affordable art.

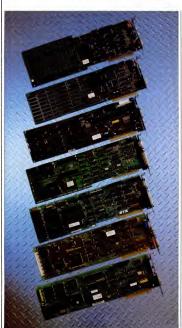


Unexpected flair



CIRCLE 347 ON READER SERVICE CARD





son's bug is someone else's feature. Being IBM-compatible has even meant that manufacturers must embed the letters "IBM" into the BIOS's of non-IBM boards (see sidebar "I'm IBM! Me Too! So Am I!").

BEYOND COMPATIBILITY Early users of the IBM EGA found that the board easily ran most software designed for the Color/Graphics Adapter (CGA) and Monochrome Adapter (often abbreviated as MDA for "Monochrome Display Adapter"). Unfortunately, "almost all" did not include the two software nackages used most often to test IBM compatibility: Flight Simulator and 1-2-3, Release IA's graphics. The 1-2-3 incompatibility (and Lotus's long delay in developing new EGA drivers) was a serious problem and probably the factor that most inhibited immediate corporate acceptance of the IBM EGA board.

The CGA and MDA both use the Motorola 6845 CRT Controller chip, but the IBM EGA does not. IBM's Technical Reference documentation for the CGA states that the Motorola 6845 CRT controller "is highly programmable with respect to raster and character parameters. Therefore, many additional modes are possible with

From top to bottom: The IBM Enhanced Graphics Adaptive with the Graphics Memors Expansion deapher-board). Quadram's Jouadicoft A. STB 8 strems 'EGA Plus. Genou Systems' Spectra EGA Model et St 8900, AST Rescuries' S AST-SG Model et St Logic's EPPC Graphics Adapter Card. and England the State of the Stat



Spectra EGA Model 4800 Genoa Systems Corp. 73 E. Trimble Rd. San Jose, CA 95131 (408) 945-9720

San Jose, CA 95131
(408) 945-9720
List Price: \$599
In Short: Some simple EGA utility programs may help you use this board with oth

video adapters. A printer port is standard GRCLE 636 ON READER SERVICE CARD AST-3G Model 1 AST Research Inc.

2121 Alton Ave. Irvine, CA 92714 (714) 863-1333 List Price: 64K version, \$450; 256K version, \$550; printer port, \$25 In Short: An optional neighter port is avail.

sion, \$550; printer port, \$25 In Short: An optional printer port is available for this otherwise straightforward EGA board that incorporates the Chips and Technologies CHIPSet. CRUS 4800, OR SEASE SERVICE CAPIT. IBM Enhanced Graphics Adapter IBM Corp.

100 N.W. 51 St. Bocs Raton, FL 33432

List Price: Enhanced Graphics Adapter (64K), \$524; Graphics Memory Expansion Card (64K), \$199; Graphics Memory Module Kit (128K), \$259 In Short IBM's bound in conth and bulks:

ule Kit (12K), \$259
In Short: IBM's board is costly and bulky, but those who will accept no substitute will somehow find the money.

ORCE 641 ON READERS WATER CARD.

EGA Plus STB Systems Inc. 601 N. Glenville, #125 Richardson, TX 75081 (214) 234-8750 List Price: \$495 In Short: A printer port and optional clock:

calendar make this a versatile board. Its BIOS is one of the fastest. CROLLETON READER SERVICE CARD EPIC Graphics Adapter Card NSI Logic Inc. Cedar Hill Business Pk. 257-B Cedar Hill Rd.

Marlboro, MA 01752 (617) 460-0717 List Price: 64K version, \$495; 256K ver-

sion, \$595 In Short: Although NSI's EPIC board lacks some EGA functionality, nearly flawless CGA emulation is built into its customized

video hardware.
CROLE 640 ON READER SERVICE CARD

EGA Master

Tecmar Inc.
6225 Cochran Rd.
Solon, OH 44139-3377
(216) 349-0600
List Price: \$395
In Short: Tecmar's EGA Master combine

In Short: Tecmar's EGA Master combines an excellent price with high levels of compatibility, while avoiding most BIOS bugs.

clever programming of the adapter."

Those who were inspired to do some clever programming did not feel so clever when the EGA was released.

Although IBM went to great lengths to make the EGA mimic most of the operations of the CGA and MDA, it did not precisely duplicate the 6845 registers, the mode-control register, and the color-control register ports present on the CGA and MDA boards. The most-useful CGA and 6845 registers (the status port, the starting address, the cursor position, the cursor size, and the light-pen registers) are duplicated on the EGA, but little else is. Programs that set the video mode and colors through the BIOS usually run fine on the EGA. Those that do it directly (like 1-2-3, Release IA's graphics and Flight Simulator) throw the screen into chaos.

Although software rarely manipulates the 6845 registers of the MDA, the EGA has another problem with the monochrome display because it interprets character attributes differently than the MDA does. Some programs use the same color attributes on the CGA and MDA because they usually look fine on both. On an EGA artached to a monochrome display, however.

er, many of them are not visible. (Both of these problems are clearly documented by IBM in the EGA Technical Reference.)

One other video board has achieved crough videoperadu use to be classified as a standard: the Hercules Card Fine Hercules and is capable of graphics resolution of 348 lines of 720 dots on a monochrome display. The Hercules also uses a 6845 CRT Controller. Since IBM rarely acknowledges standards other than its own, the IBM EGA doesn't support the Hercules standards of the property of the property

Now, perhaps, you can understand why some programs cannot run on the EGA. Understanding is of little comfort, however, if you or your company rely on one whose programs. To improve this situation, several EGA manufacturers have attempted to implement CGA, MDA, and Hercules emulation together with EGA functions.

THE PRODUCTS Now that we've explored the terrain, let's take a quick look at each of the EGA boards.

The IBM Enhanced Graphics Adapter comes with an installation manual, an unorade of the diagnostics disk, and re-

placement pages for your Guide to Operations manual. The basic board has just 64K of memory, and a daughterboard called the Graphics Memory Expansion Card adds another 64K. The Graphics Memory Module Kit contains 128K worth of chips that plug into the Expansion Card, You need 128K of memory to get 16 colors from the high-resolution mode 16 and for using a

IBM's EGA is bulkier than its competitors, mostly because it uses 16K by 4-bit memory chips instead of 64K by 4-bit chips. A fully loaded 256K-byte IBM EGA requires 32 memory chips while the other boards reviewed here provide the same memory with 8 chips.

512-character set in text modes.

IBM's EGA includes a five-pin lightpen connector and a "feature connector" that permits access to many of the video and timing signals on the board. Two RCA jacks on the back of the board also connect to this feature connector but have no other function.

Technical documentation for the IBM board (which includes schematic diagrams and a complete commented listing of the ROM BIOS) is also available, if you know the secret of how to get it (see sidebar "In Pursuit of the IBM EGA Technical Reference.")

Software support for the EGA is in the form of IBM's Graphics Development Toolkit (5495), which contains Virtual Device Interface (VDI) files loaded as CONFIG.SYS drivers and bindings for IBM's BASIC, PASCAL, C, and FORTRAN compilers (but not for the BASIC interpreter).

interpreter).

The NSI Logic's EPIC Graphics
Adapter Card is the only other EGA
board (besides IBM's) previewed here that
does not use the Chips and Technologies
CHFSet. Instead, it contains a large 1½inch-square VLSI (very large scale integration) chip that handles most of the video
logic. The strong point of this board is its
near-flawless emulation of the IBM Color
Graphics and Monochrome Adapters.

While the EPIC manual is a 32-page low-budget affair, NSI also has a technical

reference manual available for \$39,95. It mostly duplicates information in the IBM manual, but it occasionally provides more detail. A disk included with the board contains small programs (including assembly language source code) that switch the board to emulation modes.

STB Systems' EGA Plus adds a puralle primer port to a CHIPSet-based EGA implementation. An optional clock/clasher is also available. Both the video connector and the printer connector are mounted on the board's rear bracket. Although most boards mount the DIP swisch that controls the start-psyldoo mode in the rear where you can access if from the back of your PC. STB past in ear the front of the CHIPSE of the past in the control of the control of the control of the control of the power in the control of the control of the power in the control of t

Although the EGA Plus has a feature connector, it does not include the two

RCA jacks on the IBM board. It's not yet clear whether this lack will be a problem. The RCA jacks in the IBM BCA arentnected only to the feature connector, and any feature later installed may have its own jacks. If you need a printer port, the fact that it's mounted on the back of the board may be much more important to you than possible problems with "features" that don't yet exit.

The EGA Plus comes with the same PC Accelerator software included with many of the company's other products. This disk, which includes RAMdisks, print buffers, and other utilities, has nothing to do with the FGA.

Like the EGA Plus, Genos Systems Spectra EGA Model 4800 also includes a printer port mounted on the back along with the video connector. The DIP avidentes, however, are on the rate of the board it passes to the control of the contr

with the Spectra EGA. One tells you if the board can be installed, based on the date of your system ROM. The other programs allow you to change video modes and switch settings through software. You may have to change the video mode of your EGA to prevent memory conflicts with another board. For instance, if you also have a Hercules Graphics Card installed, you must switch your EGA to one of the graphics modes that use segment A000h before you switch your Hercules card to the two-page mode. Unfortunately, the manual doesn't explain this and instead tells you to switch to appropriate graphics modes before running graphics programs. In my experience, this is never necessary and even confuses many programs.

The AST-3G Model 1 supports a parallel printer port available as an option. The back of the board contains the video connector, the RCA jacks, and access to the DIP switch. A cable with the printer connector attaches at one end to the board and either hangs out the back of your machine or mounts on a separate bracket in an ad-

I'M IBM! ME TOO! SO AM I!

From our "Necessity Is the Mother of Invention" file

One of the first programs to take advantage of the IBM Enhanced Craphics Adapter was Microsoft Word, Word 2.0 decisions of the Control of the Word 2.0 decisions of the Control of the Word 3.0 decisions of the Control of the Control of the Control of the more advanced word processing features, uncharacteristically away within the EGA BIOS to check if within the EGA BIOS to check if the tests "IBM" appear in the copyright notice.

For manufacturers that must program

a BIOS for an EGA compatible, this presents a problem. If the letters "IBM" are not also embedded in the BIOS, Word will think the EGA is actually a regular old CGA and will run in white-on-black, 640 by 200 resolution.

All the EGA boards reviewed here have solved the problem; when they run Microsoft Word, it thinks it's running on an IBM EGA. How do you say "IBM" Here are some examples of how the EGA compatibles do it.—Charles Petzold

IBM Corp.: 24006277356 @ COPYRIGHT IBM 1984

AST Research: IBM is mentioned for compatibility only

NSI Logio: IBM EGA & CGA COMPATIBLE

PC Designs: @ COPYRIGHT IBM Compatible EGA BIOS

Sigma Designs: IBM EGA COMPATIBLE

STB Systems: @ COPYRIGHT 1986 STB (*IBM a TM of IBM Corp.)

Quadram Co.: Note: Some code expects "IBM" here!



640 x 350 16 COLOR



EGA PAINT



GEM



FLIGHT SIMULATOR



PAINT BRUSH



Auto CAD

NO Low-End Graphics Adapters.

Why Settle for Less?



IBM sets the standards for Monochrome, Color/Graphics and the Enhanced Graphics Adapter Hercules sets the

Graphics standard. And the MegraGraph-Plus simply redefines the standard for what the Graphics Adapter is supposed to be: Monochrome text, Hercules graphics, color graphics, enhanced graphics. And most importantly . . . No software driver patches required.

Fully Compatible You can run almost all software from

You can run almost all software from your early investment. Including Flight Simulator, Pin Ball, Jet and Lotus 1-2-3 Version 1A.

And it will still run all the business software packages written for IBM Enhanced Graphics Adapter (EGA). Examples include Auto CAD, IBM Drawing Assistant, Gem Draw, Microsoft Window, Word & Chart, Lotus 1-23 and Symphony, Dr. Halo, PC Paint Brush, EGA-Paint and many, many

Altronics is dedicated to the technical excellence of computing devices. To find out more about Altronics and our superhigh performance All-1000 & All 2000 All system compatible boards call or

Features	
----------	--

Half size, fits in any slot of PC/XT/AT	1	1	Т	
EGA compatible	1	1	1	1
CGA compatible	1	(1)	(2)	(2)
MDA compatible	1	1	1	1
Chip count	24	29	86	40
Hercules compatible 720 x 348 graphics	1	1	$\overline{}$	
No Software Patches required	1		1	1
Boot from:				$\overline{}$
- Flight Simulator	1		1	1
- Pin Ball	1	-		_
- Jet	1		1	T
Runs Lotus 1-2-3 version 1A:			$\overline{}$	T
W		(1)		

Needs software driver petches.
Competible only to the BIOS level, but not the herdware level. Will not be competible with most games s.



- Color mode

Two Video Jacks

Light Pen connector

Display Memory





256K 64K

ATronies International Inc. 491 Valley Way Milpitas, CA 95035

All system compatible boards call or Milpitas, CA 90035 (1904) Write: (4008) 943-6829 TLX: 510-600-6093 (1RCLE 19-ON READER SERVICE CARD 18M, Hercite, Flight Simulator, Fligh

The short cards, from left to right: Video-7's VEGA, Tatung's TEGA-22, Sigma Designs' SigmaEGA!, Quadram's QuadEGA+, the PC Designs Enhanced Graphics Adapter, and ATronics' MesaGraph Plus. The Chips and Technologies Enhanced Graphics CHIPSet enables manufacturers to squeeze all the display capabilities of a full-size EGA board onto a convenient half-size card.

joining slot in the machine. AST Research includes an IBM-like di-

agnostics program (with a walk-through in the manual) and a demonstration disk by Zenographics. This demo program actually turns out to be an advertisement for other AST products, but it's very attractive. Tecmar's EGA Master supports an op-

tional serial port. While serial ports are most often used for moderns (and some

printers), the manual suggests using it for a mouse. This is an excellent idea and makes the Tecmar a good one-slot "Windows board."

Like the AST-3G, the Tecmar EGA Master has its video connector, RCA iacks, and DIP switches at the rear and runs a cable to another bracket for the serial port. Although the AST-3G and EGA Master both use a BIOS created by Inter-

link Business Network, the boards are not the same

THE SHORT LIST The remaining six EGA boards are on 5-inch half-slot cards. In operation, the short cards tend to get hotter than full-length boards, but they are real marvels to look at. (Quadram and Video-7 sell both long and short versions of their EGA boards.) These six boards can



FACT FILE

MegaGraph Plus ATronics Internation al Inc. (ATI) 491 Valley Way, Bldg. 1 Milpitas, CA 95035 (408) 943-6629

List Price: \$549 In Short: The "Plus" in MegaGraph Plus eans that CGA and HGC emulation have been included in the BIOS. That's good for bootable software, but it doesn't always work. The boot message will be a nuisance if you don't use the emulation.

CIRCLE 835 ON READER SERVICE CAR

SigmaEGA! Sigma Designs 2023 O'Toole Ave San Jose, CA 95131

is standard

(408) 435-1480 List Price: \$595 In Short: A very low bug level makes this oard stand out. Hercules software emi

CIRCLE 633 ON READER SERVICE CARD

PC Designs Enhanced Graphics Adapter PC Designs Inc. 11105-B E. 56th St.

Tulsa, OK 74146 (918) 252-5550 List Price: \$299 In Short: PC Designs has placed an unbe-

lievably low price on its version of ATronics MegaGraph (no Plus), but some BIOS and hardware problems will plague those who want full EGA functionality. CIRCLE 654 ON READER SERVICE CARD

TECA.22 Tatung Co. of America

2850 El Presidio St. Lone Beach, CA 90810 (213) 637-2105 List Price: \$599 In Short: The TEGA-22 is Sigma Designs' board, but the BIOS version tested here had

too many bugs. TEGA-22 boards with later BIOS versions should work as well as the

SiemsFGA! CIRCLE AND ON READER SERVICE CARD QuadEGA+ Quadram Co.

One Ouad Way Norcross, GA 30093-2919 (404) 923-6666 List Price: \$595

In Short: Quadrum is selling Video-7's VEGA board with the same CGA and Her les software emulation. This is a fine board with a few minor problems that Video-7 is

fixing. CRCLE 631 ON READER SERVICE CARD

VECA Video-7 Inc. 550 Sycamore Dr. Milpitas, CA 95035 (800) 238-0101 List Price: \$599 In Short: The VEGA is a good choice if you

require simple CGA and Hercules software emulation on top of a good EGA implemen-

CIPCLE 630 ON READER SERVICE CAR

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single important program that won't run with those other boards. Then you'll have a computer with an expensive color adapter that can't perform your basic tasks. And EPIC?

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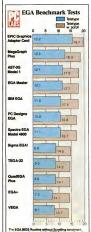
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est incassives the speed of the BirKS little por routine will come to the speed of the BirKS little per routine will receive an extra of the speed of the BirKS little per routine of routine a new routine per routine of the speed of the first speed of the speed of the speed of the speed of the first speed of the spee

he divided into three pairs; in each pair, on econpany is selling, under its own name, the board manufactured by the other. To make things more interesting, however, these boards all arrived at PC Magazine with slightly different BIOS versions, and so in some cases the boards that look identical function the same, and in other cases they function a little differently.

The ATronics International Megafraph Plus and the PC Designs Enhanced Graphics Adapter look the same, but the PC Designs EGA I teade was actually a version of the MegaGraph (without the Plus). The MegaGraph Plus can emutate the Color Graphics Adapter and the Hercules Graphics Card; the plain Megagraph—and, hence, the PC Designs EGA—cannot. PC Designs says it will begin selling the Plus version as soon as pos-

sible. Sigma Designs' SigmaEGA! is also sold by Tatung under the name TEGA-22. Both these boards come with software to emulate the Hercules Graphics Card. The SigmaEGAI is a little bulkier than the Video-7 VEGA and ATronics MegaGraph Plus and even uses a tiny daughterod for the ROM BIOS. The ROM is soldered, but the daughterboard is removable. The boards come with software to switch to the Hercules Graphic Scale emulation. Signature of the Row Sigma Card is sufficiently and the Sigma Card in Sigma Car

The Sigma and Tatung manuals say that PCs and XTs with system ROM dates of "10/27/82 or earlier" will need replacing. This is not true. The 10/27/82 PC ROM is fine; it is in fact the latest ROM available for the PC. If you wait for IBM to release a PC ROM with a date later than 10/27/82,

you will be waiting a very long time. The Video-7 VEGA and Quadram QuadEGA+ boards and manuals are identical except for the names. The manual is very good and covers both the short and long versions of these boards. A separate reference card summarizes DIPs witch settings. Emulation software for the CGA and HGC comes on a disk.

All the other boards imitate IBM by including a jumper to indicate if an Enhanced Color Display is attached to the EGA. The VEGA and QuadEGA+ boards instead have a toggle switch accessible from the back of the board. This

switch will be a big help if you'll be frequently switching the monitor on your EGA, but putting this function on a toggle switch is generally not a good idea. A toggle can be too essily switched from one position to another. Getting this switch wrong can cause problems with a monochrome display, such as smoke pouring out of your monitor.

The Video-7/Quadram short board is the only one that includes a jumper for installation in slot 8 of a PC-XT.

VARIATIONS ON A THEME The EGA boards reviewed here worked well. I tested each on both an IBM Enhanced Color Display and an IBM Monochrome Display with Microsoft Windows, 1-2-3, Release IA (with the more recent EGA drivers), Microsoft Word, Version 2.0, and IBM's Virtual Device Interface (VDI) package, 1 also ran the boards through my own test program that checked BIOS functions and register compatibility. I looked at how the non-IBM hoards dealt with some IBM BIOS bugs and quirks and with some of the more esoteric features of the EGA. This testing procedure was not an attempt to search out obscure features, but rather to determine if any of these boards will have problems with future software that takes full advantage of the IBM EGA. My findings fell under several main headings (the accompanying table, "EGA Boards: BIOS Performance," summarizes the re-

sults for each board).

**Reboot on IBM PC. Owners of PC's (but not XTs or XTs) will notice a big difference in how a Citr'. Ait. Pele command works after an IBM EGA has been installed. In short, the initialization in the EGA BIOS destroys a register that the PC. system board BIOS dater uses to skip over the long memory checks during a threaten the properties of the pro

The AST-3G, STB EGA Plus, and Tecmar EGA Master are the only boards that do not change this register. PCs with these boards boot up immediately after a Crl-Att Del. (A member of AST's technical staff told me that AST's BlOS changes the register only if an error occurs during the initialization procedure. I suspect this is a good compromise.)

 Teletype scroll calls. On the DOS command level, and in most programs that use simple line-by-line output (such as DE-BUG). DOS uses the BIOS teletype routine to display characters to the screen. This routine in the BIOS is responsible for moving the cursor, writing the character to the screen, and scrolling if necessary.

The speed of this teletype routine depends somewhat on the type of function calls the BIOS uses. To perform each teletype function, the BIOS in some boards uses additional Interrupt 10h function calls (I term these "re-entrant") and others use "internal" calls. You'll get a feel for the

implications of these differences from the PC Magazine Labs benchmark tests. which show results of speed tests that use the BIOS teletype routine. BIOS routines that use internal calls generally have faster teletype response than those that use re-entrant calls. (See "EGA Benchmark

Tests.")

There's a penalty for the faster method if you use a screen-recall utility like my WAITASEC program (see "WAITASEC While I Get That," PC Magazine, Volume 4 Number 24, page 215). People who use screen-recall programs often become addicted to them. These programs, which work by intercepting BIOS "scroll-up" not run with the SigmaEGA!. Tatung TEGA-22, Quadram QuadEGA+, and Video-7 VEGA boards.

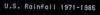
STB engineers were well aware of the potential conflict with screen-recall programs and made an excellent compromise. STB's BIOS uses internal calls for everything except scrolling. This technique. plus some generally tight coding, allowed the EGA Plus to come near the top in these time tests.

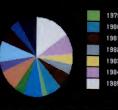
I also tested the speed of each board when directly writing to display memory in text mode 3 and EGA graphics mode 16. For the EGA graphics modes, one routine wrote blocks to the screen (a memory-

Some of the differences among the workings of the EGA BIOS are shown below. Refer to the article for an explanation of each column.

Product	Reboot on	Teletype	No. of characters in same font as IBM		Fort-change problems Monochrome ECD		Automatic tont set
Manufacturer	IBM PC	scroll calls	8×8	14×8	underline	CHLEGI	on mode change
IBM Enhanced Graphics Adapter IBM Corp.	Long	Re-entrant	256	256	Gone .	Gone	Wrong no. of lines, no cursor on ECD
EPIC Graphics Adapter Card NSI Logic	Long	Re-entrant	256	253	Gone	Gone	No cursor on ECD
AST-3G Model 1 AST Research	Short	Re-entrant	239	251	Gone	Gone	Blanks out
Spectra EGA Model 4800 Genoa Systems Corp.	Long	Re-entrant	256	256	Gone	Gone	Blanks out and crashes
EGA Plus STB Systems	Short	Re-entrant	92	94	Gone	Gone	Unreadable font, sometimes crashes
EGA Master Tecmar	Short	Re-entrant	239	251	Gone	Gone	Blanks out
MegaGraph Plus ATronics International	Long	Re-entrant	256	256	Gone	Gone	Wrong no. of lines, no cursor on ECD
PC Designs Enhanced Graphics Adapter PC Designs	Long	Re-entrant	256	256	Gone	Gone	Wrong no. of lines, no cursor on ECD
SigmaEGAI Sigma Designs	Long	Internal	256	256	Gone	Gone	No cursor on ECD
TEGA-22 Tatung Co. of America	Long	Internal	256	256	Gone	Gone	No cursor on ECD
QuadEGA+ Quadram Co.	tong,	Interest	256	255	Suit	Goro (except if 25 lines)	No otrisar dirECD
VEGA Video-7	Long	Internal	256	255	Gone	Gone (except if 25 lines)	No cursor on ECD







EGA Mode

Plantronics Mode

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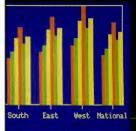
AutoSwitch. Only Paradise has it.

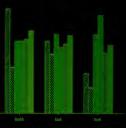
The Paradise AutoSwitch EGA changes video modes automatically to work with your software. No Mode commands. No special software to run. On RGB monitors it "autoswitches" between EGA, CGA (IBM Color Graphics) and Plantronics modes: on monochrome

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CGA Mode

Hercules Mode

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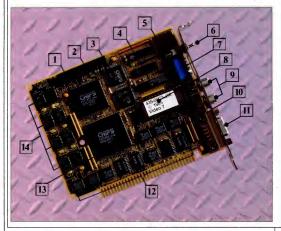
ANATOMY OF AN EGA BOARD

Packing all the functions of an Encinch and handed Graphics Adapter onto a Sinch and handly seems possible, yet the Video-7 VEGA board makes it look easy and even beaufull. Most of the work is done by the four-chip Chips and Technologies Enhanced Graphics CHIPSet (the chips numbered 82C43x). Programmable logic arrays and surface-mount technology also help to keep the size The 82C431 Graphics Controller controls the transfer of data between the video memory and the CPU when a program is writing or reading to the adapter, and from the video memory to the Attributes Controller for the display of text or graphics.

2. The Feature Connector provides external devices with access to many of the board's important timing and output signals and substitutes the device's own video signals for those generated on the

 The 82C433 Attributes Controller controls the mapping of the 16 color attributes to the 64 possible EGA colors while generating the final signals sent to the video display.

The 82C432 Sequencer generates signals for controlling memory accesses.
 The 16,257-MHz crystal generates the dot clock and other timings for all



EGA video modes that use 350 scan lines. The 14-MHz dot clock for 200 scan-line video modes come from the PC system bus. This clock determines the rate at which individual dot signals are sent to the display.

6. On most boards, the monitor type is selected by a jumper connection, but the Video-7 board uses a toggle switch. One position specifies that an Enhanced Color Display is attached to the board; the other position indicates a Color/Graphics or

Monochrome display.

7. The DIP switch settings tell the BIOS what type of monitor is attached, whether the EGA is primary or secondary, and what video mode should be in effect dur-

ing power up.

8. The ROM BIOS does not directly control anything on the board. It initializes the board during booting, provides a medium-level programming interface to board functions, and contains fonts that are loaded into memory for text modes.

9. The two RCA jacks are attached only to the feature connector and have no direct function on the board.

10. The Light Pen Connector is compatible with that on the CGA board. 11. The monitor is attached to this Video Output Connector.

 Other integrated circuits provide an interface between the system bus and the video chips.

13. The 82C434 CRT Controller generates most of the synchronization timings for the video display. Registers on this chip control the number of characters per line, the number of lines per screen, the number of scan lines, and the cursor the number of scan lines, and the cursor the number of scan lines.

position.

14. Each chip in the display memory stores 64K four-bit values for a total of 256K bytes. In graphics modes, each of the four groups of 64K bytes stores the dot patterns for a particular color plane. In text modes, the memory stores the A5-CII character codes, the attribute (or color) codes, and up to four different fonts with dot natterns for 256 characters each.

intensive operation) and another wrote lines to the screen (which involves frequent register manipulation). These three tests are not shown in the benchmark graphs because all the boards ran them at the same speed except for NSI's EPIC board, which was 5 to 15 percent faster than all the others.

■ Number of characters in same font as IBM. The IBM EGA's BIOS contains dot patterns for each available screen font. Most boards use IBM's fonts or something very close, except for the EGA Plus. In the table, the columns under the heading "No. of characters in same font as IBM" compare each EGA font with IBM's.

The EGA BIOS includes a routine to load a user-defined font. This BIOS call also allows you to change the number of lines displayed on the screen. For instance, the normal text mode characters when the EGA is connected to an Enhanced Color or Monochrome Display have 14 scan lines. You can use the 8-scan-line character set to get 43 lines instead of 25.

We Fort-change problems. Unfortunately, the IBM BIOS has some bugs in the fort-loading routines. One of these affects the underline attribute when you use the BIOS to change the fort on the Monochrome Display. All the non-IBM EGA boards duplicate IBM's bug by making the underline

disappear. When an Enhanced Color Display is attached to the IBM EGA, this same BIOS call causes the cursor to disappear. All the other EGA boards do the same except the QuadEGA+ and the VEGA, which preserve the cursor if you're retaining 25character lines on the screen. The problem with the IBM BIOS relates to a need for "cursor size emulation" on the Enhanced Color Display. Many programs assume that each character has 8 scan lines when setting the shape and size of the cursor, so the IBM EGA BIOS has to adjust for the actual 14 scan lines. However, it makes this adjustment based not on the character font that's loaded but simply on whether an IBM Enhanced Color Display is attached. This problem is compounded during font loading.

Automatic font set on mode change. The IBM EGA BIOS has a facility to automatically load a font during a video-mode change. The BIOS uses pointers set in

lower memory to address this font. This is a nice feature, but it has not been well timplemented. IBM's BIOS loads the font, but if doesn't correctly calculate he number of lines that appear on the screen, which causes problems with teletype output. The ATronics and the PC Designs boards duplicate IBM's BIO. The AST, Genoa, STB, and Tecmar boards don't work stall with this facility.

MORE PROBLEMS Some EGA boards include a few of their own bugs as well as those duplicated (or expanded upon) from IBM's board.

■ Some EGA boards include their own bugs as

well as those duplicated from IBM's boards.

EGA-standard boards are capable of using a 512-character set in text mode by storing two fonts of 256 characters each. The bit in the video attribute that normally defines high intensity is used instead for selecting between the two fonts: this has applications in bilingual word processors. All of the boards handled the 512-character set except the PC Designs EGA and ATronics MegaGraph Plus. In fact, these boards would not even correctly run a sample program IBM included in its EGA Technical Reference manual to illustrate the 512-character set! (Following my testing, ATronics sent us a revised Mega-Graph Plus board that corrected the 512character set problem.)

training the Department of the American Indian Personal Form with the BIOS Load Fort toutines, in which some register recalculations are performed. No matter what I told it, it always loaded the 8 by 8 front. Whên displayed, the bottom part of each character still contained whatever happened to be in memory prior to the load. A later version of the same BIOS in the MegaGraph Plus did it right.

(After testing had been completed, PC Designs sent us a new board with the

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ATronics hardware but using a BIOS copyrighted by Quintessential Consultants Inc. (QCI) and dated 41/586. This new BIOS did not exhibit the problems I found in the earlier board. However, the new PC Designs board sometimes left random lines on the screen when the BIOS scrolled text in a graphics mode.)

The Tatung TEGA-22's BIOS Write Do routine made the screen go crazy in EGA graphics mode. This is not as serious a problem as it may seen. Virtually all graphics programs avoid the BIOS Write Dot routine (it is exerculatingly slow) and instead write directly to the screen. The TEGA-22 handled graphics fine when writing directly to the screen, cothy the control of the same biody of the same biody of the same biody of the same biody on the SignateGA1 board worked fine, but the Read Dor routine didn't work.

The Tatung board also used different loogic for the Wire String BIOS roller String BIOS roller shared where characters and attributes alternate. BIMS 1 so gire requires than to attributes alternate runs or line focal. Statung's logic ascurates attributes are present and skipn over them. Tatung's approach is actually easier is actually cashed in actually cashed in a trading stap protein is actually easier by the statung is approached to the statung its approached in the statung is approached to the statung its actual process of the statung is approached to the statung its actual process of the statung is actually asset to the statung its actual process of the statung its actual

Software may program the EGA board to generate the hardware interrupt IRQ2 (corresponding to Interrupt OAh on the software level) at the beginning of a vertical retrace. In updates to the PC and XT Technical Reference manuals, IBM classifies IRO2 as specifically the "EGA interrupt," although other hardware, like the Microsoft Mouse, uses it too. All the non-IBM EGA boards handled this interrupt well except for the Quadram QuadEGA+ and the Video-7 VEGA, which generated the interrupt but reversed the bit in the status port. These two boards act in accordance with IBM's documentation, but not in accordance with IBM's (and everyone else's) implementation.

The QuadEGA+ and VEGA do some other strange things besides. If these BIOS's encounter a problem during booting, they will store an error code down in lower memory in a place reserved for the expansion memory size. On a PC (but not

XT or AT), this code will cause your system to believe it has run out of memory prematurely, perhaps even before your CONFIG.SYS file gets done. (Following my testing, Video-7 sent us another VEGA board labeled Revision 3 with a BIOS version of 1.052 that corrected the vertical interrupt status bit, allowed a PC to boot up immediately after a Ctrl-Alt-Del. didn't save an error code in the BIOS data area, and used re-entrant calls in the BIOS teletype routine. This latter change caused the new VEGA board to register the slowest response in the teletype speed tests of all the boards except the NSI EPIC, proving once again that you really can't have it

all.)
I'll have some good things to say about
NSI's EPIC board when I discuss CGA
emulation. However, the EPIC's EGA implementation is, quite simply, not as good
as those of the boards that use the Chips
and Technologies CHIPSet.

If you use the NSI EPIC with a monochrome display, you will notice almost inmediately that the line and block drawing characters (character codes COth through DFh) do not connect on the horizontal. The IBM and Chips and Technologies chips sets roll over the eighth dot for these characters in the monochrome's 14-by 9-character box. NSI's does not. Solid horizontal lines from the IBM Monochrome Adapter become dashed lines on the EPIC

The video parameters used by the NSI EPIC differ in a few values from those in the IBM and Chips and Technologies EGA implementations. These differences are not documented in NSI's technical reference manual and may cause problems for programs that must load registers.

EPIC's vertical retrace signal goes high fare the vertical ertrace has completed, which may cause some black line static at the top of your screen during a patch change. During horizontal pel panning intest modes, the right-most column of chaacters has incorrect color attributes. Using pils screens in ten mode does it would we less everything is on a character boundary. The IBM board and all the boards that of the Chips and Technologies CHIPSect had no problem with these tasks.

Are these just minor defects in NSI's EGA implementation? Probably—unless, of course, you want to use these features.

SIX VIEWS OF WINDOWS

When you put them up on the screen and compare all of them together,

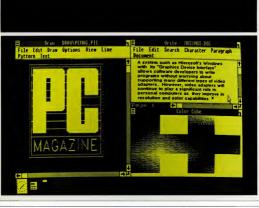
the differences between one combination of hardware and another are dramatic.

The six screen images here illustrate improvements you can expect if you upgrade to a video adapter with the resolution and color capability of the histon and color capability of the Microsoft Wuldows to dramatize the differences among the display adaptermost incr combinations because of its layered graphics and vivid use of color, Windows costs only 590, but if you buy it you thing you also want to invest in a hardware upgrade to take advantage of these features of these features.

In each screen image, the window at the left was created in Micrograft's Windows Draw', one of the first available independently released Windows applications. The upper-right's Hand corner shows a document created in Windows Wrize (an application that comes with Windows). The lower-right-hand corner shows an unifolded "color cube" specially programmed for this demonstration.—Charles Petch.

Top right: This is what Windows looks like on an IBM Monochrome Adapter and Display. Windows uses graphics, and the Monochrome Adapter cannot do graphics. The Monochrome Adapter once served us well, but now it z got to go. What can you do with your old Mono board? Wouldn't tibe fin to breakt it in hal?

Bottom right: A Hercules Graphics Card attached to a monochrome display helps out. The resolution (348 lines of 720 dots each) is fine, but the only colors you get are green and black. That's acceptable if you already have a Hercules card, but it doesn't exactly make your jow drop, does it?







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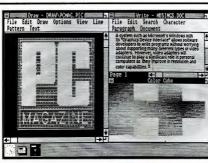
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The IBM ColoriGraphics Adapter works with Windows, if you call this working. There's really only one word to describe this harsh black-andwhite 'high-resolution' mode of 200 lines by 640 dots: ugly.



An EGA attached to a monochrome display has slightly lower resolution than the Hercules Graphics Card (350 lines of 640 dots). Although four "colors" are available (black, green, bright green, and blinking green), Windows uses only the first two. Every time you move the mouse, it leaves traces (I almost said "droppings") across the highpersistence display.



Ahhh, now we're getting someplace. The EGA attached to an IBM Color/Graphics Display (or a 64K EGA attached to an IBM Enhanced Color Display) lights up your screen with color. The resolution is the same as the high-resolution black-and-white mode on an IBM Color/Graphics Adapter (200 lines of 640 dots), but the 16 colors make it much more attractive.



An EGA with 128K or 256K of memory attached to an IBM Enhanced Color Display provides to Color Display provides to Color Display for Color Display for Color Display for Colors. That's the best the EGA con do, and it's good enough for now. Compared with the next generation of video adapters, however, this will probably look as crude as a CGA looks to us now.



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■ EGA STANDARD

EMULATION: GOOD, BAD, AND UGLY Most existing software written for the Color/Graphics Adapter or the Monochrome Adapter will run fine on the IBM EGA. Programs that directly manipulate some registers on the CGA or MDA board, however, will send the display into seizures. For this reason, several manufacturers have attempted to implement CGA. MDA, and Hercules emulation on their FGA cards

The Chips and Technologies Enhanced Graphics CHIPSet does not easily lend itself to this emulation. The registers that correspond to the 6845 registers are built into the CRT Controller chip, and nothing comparable to the CGA, MDA, and Hercules mode register and color register is present. Significantly, the NSI EPIC board, the one that does not use the Chips and Technologies CHIPSet, is the only board that has a hardware solution to emulation. The other boards that include emulation (MegaGraph Plus, SigmaEGA!, TEGA-22, QuadEGA+, and VEGA) all use a software approach. The difference in

SigmaEGA!

TEGA-22

Video-7

IBM Corp.

Sigma Designs

Spectra EGA Model 4880

Genoa Systems Corp.

Tatung Co. of America

IBM Enhanced Graphics Adapter

EGA Boards: Summary of Features

results makes it clear that hardware emulation is superior.

None of the manufacturers that used software emulation were willing to discuss details with me. When I described my understanding of the method to a technical representative at one company, he commented that my description was "good enough for government work." That is not quite the standard PC Magazine aspires toward, but it will have to do.

The method used by the Video-7 VEGA and Quadram QuadEGA+ boards is characteristic of the software approach to emulation. Supplied with these boards is a RAM-resident program that you use to turn on or turn off CGA or Hercules emulation. This program manipulates a special register on the board to generate a "nonmaskable interrupt" whenever the board receives a command from a program to load one of the CGA or Hercules registers that is either not duplicated on the EGA or that has a different meaning. (This nonmaskable interrupt is normally used by the PC to catch memory errors and shut down

your system with the infamous "Parity Check" message.)

When a program attempts to write to one of these registers, the resident software intercepts this nonmaskable interrupt. If the register is one of the 6845 registers that is not defined the same as the EGA registers with the same addresses, it will simply ignore it. If the register is the non-6845 mode control on the CGA or Hercules, it will initiate a mode change through normal

Since this emulation technique requires the resident program, it cannot be used with software that must boot directly from a floppy disk. In addition, because it is a resident program, the emulation software may conflict with other programs. For instance, two of the debuggers I used (or tried to use) to understand the workings of this emulation technique were also using the nonmaskable interrupt as a hardware break. Every time I tried to load a CGA register, IBM's Professional Debug Facility told me that I should check my memory for parity errors.

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AST-36 Model 1 AST Research	\$450	\$550	Parallel port	2 years	Diagnostics, demo	Full
EPIC Graphics Adapter Card NSI Logic	\$495	\$595	Optional parallel port (\$25)	2 years	Emulation	Full
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Perallel port: Optional.

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If a CGA program attempts to legitimately manipulate a 6845 register not duplicated in the EGA, it will be ignored. If an EGA-aware program attempts to manipulate some of these overlapping regisiters in emulation mode, it will also be ig-

The resultant emulation is nowhere close to 100-percent register compatible, and it's not even BIOS compatible. For instance, on a CGA in graphics mode 6 (200 line by 640 dot two color), the following assembly language BIOS call will turn the foreground blue:

MOV BX, ØØØ1h MOV AH, ØBh

(using BASIC syntax):

INT 10h

In CGA emulation mode, the QuadEGA+ and VEGA boards respond by making the background blue, which is the same thing that happens on an EGA board in nonemulation mode. On the CGA board, you can create a blue foreground in high resolution by soine directly to the CGA color resister. OUT &H3D9.1

This is an output port not implemented on the EGA, and normally nothing happens. In CGA emulation mode on the Quad-

In CGA emulation mode on the Quad-EGA+ and VEGA boards, the same thing

■ Because it is resident software, Video-7

and Quadram's CGA- and Hercules-emulation

program may conflict with other programs.

happens: nothing. You can go through a couple years' worth of PC Magazine's User-to-User columns and try out all the CGA special effects, but you'll find that

virtually none of them work in Video-7's

and Quadram's CGA emulation mode. Don't get the wrong impression, however: the CGA emulation mode definitely will run some programs that cannot run on an EGA. Lotus's 1-2-3, Release 1A, with the original CGA drivers, runs graphics with the CGA emulators, which is more than it does on a standard EGA. You'll notice some speed degradation during display updates and some intermittent garbage on the screen when switching from graphics to text, but it works. (You can also get Lotus's EGA drivers for 1-2-3. Release 1A, which will work a lot better.) You can also run Flight Simulator if you execute it as a program instead of booting from the disk. The EGA cannot do these things, and Quadram's and Video-7's boards can. Just be aware of their limitations

I'm not picking on Quadram and Vidco-7; the SigmaEGA! and Tatung TEGA-22 boards also have resident software that uses the same type of approach as the VEGA and QuadEGA+, but that only (at

	Graphics chip	Emulation						Technical		BIOS version
Chip count		Color/grap Claimed	hics Actual	Monochron Claimed	me adapter Actual	Hercules g Claimed	aphics Actual	reference available	BIOS copyright	(or date) tested
23	Chips and Technologies	No	-	No	-	No	-	No	Eden Software	1.00
38	Chips and Technologies	No	_	No	-	No	_	No	Interlink Busi- ness Network	1.21
40	Chips and Technologies	No	_	No		No ·	-	Planned	STB and Award Software	1.07
23	Chips and Technologies	Yes	Erratic	No -	-	Yes	Erratic	No	Eden Software	1.03H
41	Chips and Technologies	No	-	No	-	No	-	Planned	Interlink Busi- ness Network	1.19
33	Proprietary	Yes	Very good	Yes	Good	No		Yes	NSI	2.15 (10/31/85)
28	Chips and Technologies	Yes	Adequate	No	_	Yes	Adequate	No	Video-7	1.03 (1/29/86)
30	Chips and Technologies	No	-	No		Yes	Adequate	Planned	Sigma Designs	1.06
41	Chips and Technologies	No	-	No	_	No	-	Plannud	Gonoa	1.10
30	Chips and Technologies	No	-	No	-	Yes	Adequate	Planned (Sigma Dusions)	Sigma Designs	1.04
28	Chips and Tuchnologies	Yas	Adequate	No	-	Yes	Adequate	Planned	Video-7	1.04B (3/19/86)
75	Proprietary	No	_	No	_	No	_	Yes	IBM	9/13/84

VIDEOGRAM 3.0 GRAPHICS SOFTWARE FOR THE EGA

VIDEOGRAM point software will run on any 256K EGA and it will run fester. VIDEOGRAM graphics directly

VIDEOGRAM graphics directly address the EGA chip set in assembler. No other product can match it.

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VIDEOGRAM gives you 43 text fonts in point sizes from 5 dots to 32 dots. Sefore locking in your text you can change the font, size, color, or position of the last without ensing or disturbing the graphics.

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this time) implements Hercules Graphics Card emulation.

Under Hercules emulation, the SigmaEGA. TEGA-2: QuadEGA+, and VEGA boards all ran 1-2-3 with the Hercules drivers. Microsoft Windows installed for a Hercules card, and HBASIC. But if you try running Microsoft Word. Version 2.0, with the 14 popion (which will give you 43 lines on a Hercules card), Word will not recognize the board as a Hercules and will instead use 25 lines in EGA monochrome mode 15. (The new Version

3 of Word will give you 43 lines on an EGA, too.)

The ATronics MegaGraph Plus takes a sightly different approach to embracian instead of supplying a resident program. ATronics built the emulation routines into the BIOS. When you boot up your PC, the BIOS displays ansessage to the screen telling you to press F2 for emulation mode. You can press another key for nonemulation or wait about 10 seconds for booting to continue. The MegaGraph Plus will provide CGA emulation on a color display

IN PURSUIT OF THE IBM EGA TECHNICAL REFERENCE

If you prepare correctly-memorize the right question,

anticipale the wrong answers, and practice not flinching when you hear the price—you can get your very own EGA Tech Ref.

BM's 164-page Technical Reference manual for the Enhanced Graphics Adapter contains a description of all the EGA registers, a schematic diagram of the board, a complete commented listing of the ROM BIOS, and a few small programming examples. This document is essential for anyone who wishes to use the EGA BIOS or develop graphics applications for the EGA independent of the arrabics interfaces of neckness like

Microsoft Windows or IBM's Graphics Development Toolkit. You may have a problem finding the EGA Tech Ref and may conclude that it's only available to people with contacts or a specific need to know. Even authorized IBM dealers often don't know that the EGA Tech Ref exists.

But it does exist. If you want it, here is how you can get it:

■ Go to an authorized IBM dealer and say, "I want the two-volume Options and Adapters Technical Reference Manual, IBM part number 6322509." Do not flinch when the salesperson says, "That will be \$125, please." Don't be too distressed when you take it home and find out it's rather skimpv and doesn't contain anything about the EGA.

■ Very important: trapped between the shrink wrap and the two-volume manual is a card entitled: "Update Information Service Registration Card." Don't throw it away. Fill it out and drop it in a mailbox. This card entitles you to all updates published between April 1984 (when the manual was first published) and September 1986.

Typ out to be too impatient af first, but, as you enter the fourth week, you are entitled to start anticipating a box from UPS. This box contains a third hinder (you'll need it) and a whole pile of updates. Besides the EAG pages, you'll get exchinical reference documentation for the Protessional Graphics Controller (200 pages), the Data Acquisitions Adapter (142 pages), the Voice Commanications Adapter (13 pages), and loss nations and pages for the protession of the Protes

If you discover items in the EGA Tech Ref that don't quite make sense or agree with reality as you've experienced it, don't be alarmed. The manual is packed with errors, but if you're already in this deep, you'll probably have fun figuring them out.—Charles Petzold



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- RS232 asynchronous communication · Princetoo Graphics MAX-12 amber mono-
- · High resolution monochrome graphics display card

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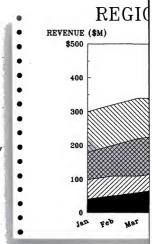
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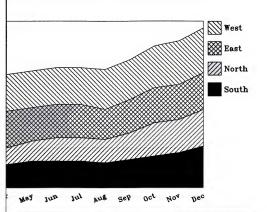
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and Hercules emulation on a monochrome display. There is no way to turn off initial boot message, even if you never want emulation. The MegaGraph (without the Plus) sells for \$499 and does not include emulation or this message "feature."

Instead of using the nonmaskable interrupt, ATTonics uses IRQ2, which in software is interpreted as an Interrupt OAh. This interrupt was originally "reserved" by IBM, but with the introduction of the EGA it has become officially designated as the EGA interrupt, since the EGA can generate an IRQ2 on vertical retance. Other hardware, such as the Microsoft Bus Mouse. also uses IRQ2.

I found the ATronics emulation erratic: sometimes it worked, sometimes it didn't. Sometimes the screen went blank after I pressed F2. Sometimes it said I had emulation mode and I really didn't. Other times, however, it worked about as well as the other four boards that use software emulation

Since these manufacturers consider their emulation methods to be proprietary, the additional registers they've included on the board to support emulation are not doc-

umented. My experience with these software emulation techniques led me to admire the attitudes of some companies (like Tecmar) that told me outright they don't think that emulation is an important issue and have no plans to implement something similar. It also increased my admiration for the one board reviewed here that handles emulation through hardware: the NSI FPIC

EMULATION THE RIGHT WAY The NSI EPIC board takes a very different approach to emulation. Since NSI developed its own video chip, it was able to include CGA and MDA emulation right in the hardware. NSI has no plans to include Hercules emulation since it believes monochrome displays on the EGA will not be common.

The CGA and MDA emulation on NSI's EPIC is complete except for interlace, which is sometimes used for creating 50-line displays on these boards. I couldn't find anything wrong with it. The EPIC uses some of the 'unused' bits of certain EGA registers to control emulation. The



The generally consistent high qualitv of the 12 EGA boards reviewed here means you really can't go wrong with any of them. The best overall value is offered by Tecmar's EGA Master, which combines the Chips and Technologies Enhanced Graphics CHIPSet with a BIOS nearly free of problems on a \$395 card. Its serial port option (not available on any other EGA board) is ideal for a mouse and makes the EGA Master a good hardware companion to Microsoft Windows. Tecmar's thumbs-down position on CGA emulation can only be viewed as admirable in the light of the sloppy emulation techniques that other manufacturers have wastefully pursued

Afew of the other boards also stand out for specific features: Sigmod Designs' SignatEAT has the least bugge BIOS and hardware, STB Systems EAO Plus has the fastest re-entrum BIOS seletype routions, NSL bagie's EPIC Graphics Adapter Card has the best CG of enulation, and the BiM Enhanced Graphics Adapter has a bulk and helf that seems Carraingly quaint in comparison with functionally equivation EAO housed no -third its six-

EPIC BIOS also supports emulation modes with a modest extension to the "Mode Change" function call. It's all documented in NSI's EPIC Technical Reference manual.

The CGA emulation of the EPIC board is so authentic it's uncanny. Suddenly you're looking at those familiar grainy characters on a screen that flickers when it scrolls. You'll think someone stole your EGA board and replaced it with a CGA. NSI is so sure of its emulation that it uses the PC's regular BIOS for most BIOS calls.

Although EPIC's MDA emulation mode uses monochrome attributes that

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processor as it executes program

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closely resemble the IBM Monochrome Adapter's, they are not quite identical. (Neither, for that matter, are those on the Hercules Graphics Card.)

But here's the most interesting thing:

the EPIC does not reset the video mode on a Ctrl-Alt-Del reset. Once you run the program to switch into emulation mode, you can run non-DOS bootable disks or even other operating systems. In addition, you

can set CGA or MDA emulation modes, via DIP switches on the board, to be in effect at power-up.

Moreover, the EPIC can do something in hardware that people have spent countless hours trying to do in software: it can stop the cursor from blinking.

The only real problem with EPIC's emulation involves "smart" programs like Microsoft Word, Version 2.0, that recognize an EGA through unorthodox methods. In CGA emulation mode, Word still thinks that the EPIC is an EGA board, However, because Word can't switch the adapter to mode 16, nothing much hap-

The hardware emulation of the CGA implemented in NS1's EPIC card is so clearly superior to the software emulation of the other boards reviewed here that it is beyond comparison. If you need it, here it is it, However, EPIC's failings in EGA features indicate more clearly than ever what a superb job Chips and Technologies has done in its Enhanced Graphics CHIPSet design.

THE FUTURE The CGA and Hercules contained in some will refuse to die for a while longer. I suspect. Surely there's or and harm in emission if it doesn't level to make overall performance, and it would be nice overall performance, and it would be nice the operation of several different adapters. One obvious approach is to put both a Chips and Technologies Enhanced Graphics CHIPSect and a 6845 on one board, Such a board will probably be available by the time you read this, although I can't pre-country to the control of the cont

The EGA is not the last word in video adapters. But right now, with thanks due in large part to Chips and Technologies for doing the dirty work, the EGA is the only video adapter that can serve as a modestly priced near-universal replacement for the old Monochrome and Color/Graphics Adapters and even (sorry, Hercules) the Hercules Craphics Card.

Charles Petzold is a contributing editor of PC Magazine. See the Programming column in this issue for the beginning of his two-part exploration into some of the EGA's hidden talents.



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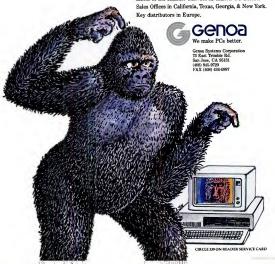
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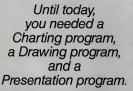


















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Two Build-Your-Own Alternatives for



Boy, do I feel smug! I've got my feet up on the desk as I listen to my two newly built AT compatibles hum along contentedly. Better yet, my build-it-yourself machines are running at lightning processor speeds: 10 MHz.

These two respectable alternatives come from distinctly different backgrounds. Machine number one is the new PC Designs ET286i (ET stands for Enhanced Technology) kit, which includes everything you need to build your own in one tight package. PC Designs relieves you of any other purchasing duties: your job is simply to connect the components, which are guaranteed to work together. Machine number two, however, required a bit more know-how because it wasn't a prepackaged kit. I based the system on a Red River Technology motherboard and pieced the machine together with components purchased separately. Considerably more challenging to acquire than the PC Designs kit, but not much more difficult to assemble, the Red River design is much more customized to my own tastes and needs. However, buying what I wanted separately cost me more than buying a complete system kit from PC Designs.

You don't need a background in electrical engineering to create your own personal AT-style machine. These two computers offer customization to those willing to turn a few screws.

You don't have to be a high-tech, wires-and-pliers hardware nut to assemble an AT kit. I was not the kind of kid, for example, who was atmatted to Tinker Toys and Erector Sets. I've never been possessed by a drive to discover the way things work. As an adult, I'm inclined to leave the insides of machines to others who find hardware anatomy fascinatine.

So what's a nontechie like me doing putting togeth

er an AT? Since outgrowing my old dualfloppy disk PC compatible, I've been searching for an AT compatible with a perfect price/performance ratio. I suspected that kits would offer a lot for the buck.

Building my own AT also nudged along my growing awareness that only I could configure my system to meet my own well-defined needs. The situation has changed drastically from the days when anyone could walk into a store, order an off-the-shelf machine, and not worry about peripherals. The fact is, expansion boards, cards, and peripherals require product savvy and a good understanding of your own particular-perhaps even idiosyncratic-configuration needs.

The technical skills required for assembling an ET286i are the same as those required to upgrade a PC by adding a hard disk.

Over 3 months have passed since I began my quest to build my perfect AT. Most of this time has been spent not in assembling the kits, but in acquiring the parts. I've waited patiently for components to arrive, sent back faulty pieces, and endlessly tested various peripherals and software packages to sort out compatibility pitfalls.

ALL-IN-ONE The PC Designs prepackaged ET286i kit offers the more cautious approach. PC Designs evaluates and tests all the AT kit components and sells only those that meet its standards. The technical skills required for assembling an ET286i are the same as those required to upgrade a PC by adding a hard disk or to "repair" a PC or XT by swapping out a card or disk drive. If you can follow simple instructions and can use a screwdriver, you can build the PC Designs kit in about 2 hours-if all goes well, that is. And if things go wrong, as they did in my case,



The cost-effective PC Designs ET286i kit contoins (clockwise from top left): the PC chassis with the motherboard alreads installed, the nower supply and cable, an optional hard disk, a 360K-byte floppy

drive, an AT-style keyboard. documentation, a disk controller card, and o monochrome graphics card with printer port. Missing from this picture is the monochrome inonitor.

Building the ET286i hasically entails placing components in the chassis and making the right connections The hard disk instollotion is shown here. Another important step in the process involves selecting proper configuration option: on the motherboard. Mmor differences hetween various disploy cords and serial and parallel para configurations entail different connections, as explained in the documentation

you have to deal with only one supplier. The ET286i boasts 100 percent plugcompatibility with the IBM PC AT and an identical footprint. It comes with a chassis, 200-watt power supply. AT-style keyboard, motherboard, cables, monochrome graphics/printer card, a Princeton Graph-

and floppy disk controller, a half-height Omek floppy disk drive, and a bagful of the necessary fasteners. PC Designs sells the chassis with the motherboard and the disk controller already installed and tested. The 10-MHz configuration costs \$2,400: the 8-MHz version is just \$1,995. ics MAX 12 amber monochrome monitor,

The machine comes standard with I megabyte of memory, three serial ports.





(although DOS uses only two), two parallel ports, and six AT-style (16-bit) plus two PC-style (8-bit) expansion slots. The memory chips are 150-nanosecond devices, which is surprising because that is

the speed used in a stock 6-MHz IBM PC AT. (Red River uses 120-nanosecond memory devices.)

Enhancements available for the ET286i machine include a variety of Seagate and Core voice-coil hard disk drives; graphics adapters from Everex, ATI, and Hercules: PC Designs' own EGA display (see review in this issue in "Achieving the Standard: 12 EGA Boards"); Haves-compatible modems; tape-backup systems; and three different Princeton monitors.

If you're dissatisfied with the purchase, you may return the machine to PC Designs within 30 days for a full refund. The documentation, though not especially well produced or well organized, is thorough. The amount and quality of information contained in the manual is worthwhile in it-

KEYBOARD-CONTROLLED SPEED The PC Designs motherboard uses the Intel 80286-10 high-speed 16-bit processor chip. Pressing Ctrl-Shift-Alt-Del shifts the machine from a cruising speed of 6 MHz to its highest gear, 10 MHz. Keyboard-controlled speed is an especially nice feature because some software won't allow you to boot at high speed, even though the package will run at high speed.

With its sights set on the future, the PC Designs motherboard is eminently configurable. Jumpers allow you to use different kinds of memory chips and different sizes of ROM BIOS chips. The serial ports are configurable to RS-232, the current

standard, or RS-422, an emerging standard. Like any AT-compatible, the ET286i has a battery-powered parameter memory and clock. The parameter memory is used to record the hardware configuration (disk type, floppy type, display type, memory size) so that PC-DOS can behave appropriately. On an IBM PC AT, the setup section of the AT Diagnostics program (included in the AT User's Guide) is used to set the values in the parameter memory. On the ET286i, the ROM BIOS (made by ACS, a Texas firm) allows you to set the parameter memory as part of the booting process. This significant convenience means that you don't need to purchase IBM's Advanced Diagnostics to use the machine. (The regular AT Diagnostics program cannot be purchased separately.)

At the time of my purchase, the lithium battery for the parameter memory was un-



ET286 PC Designs 5837 S. Garnett

Tulsa, OK 74146 (918) 252-5550

List Price: 6/10 MHz, \$2,400; 6/8 MHz, \$1,995 (includes: AT-compatible BIOS with Setup program, I megabyte of RAM, three serial ports, two Centronics parallel ports, Princeton Graphics MAX12 Amber Mono

chrome Display, high-resolution monochrome graphics display card, Western Digital combination floppy and hard disk controller, 192-watt Fortron power supply, eight expansion slots, battery-backed-up CMOS calendar, choice of 360K or 1.2 Mbyte floppy disk drive, AT-style case and chassis, AT-compatible keyboard). Options: 80287 coprocessor, Core ATPlus and Seagate voice-coil hard disk drives; 20-60-, and 100-Mbyte tape backups; Hayescompatible moderns; color monitors. Microprocessor: 80286

Clock Speed: 6 and 10 MHz or 6 and 8 MHz In Short: An easy-to-assemble, prepackaged AT kit at an almost obscenely low price. Completely AT compatible, especially at

lower clock speeds CIRCLE MAS ON PEADER SERVICE CARD

available for the ET286i. Each time I turned the machine on. I had to reassign the parameter values. This is a prime example of the "I can't get what I need" syndrome that plagues the kit market: when you're putting the pieces together yourself. you're sure to be irked by the unavailability of some significant fragment.

Much of the process of assembling the ET286i involves inspection as opposed to construction. Checking to make sure everything survived shipping is especially important when you're assembling a kit. Once you've unpacked and taken inventory, the assembly begins. Just follow the clear, well-illustrated instructions.

 Select the monitor type by jumpering a pin connector on the motherboard.

 Connect the port interface cables from the motherboard to the rear-panel cutouts. Install and connect the power supply to

the motherboard. ■ Install the speaker in the bracket pro-

vided and connect it to the motherboard. Install the power LED and lithium battery (once the battery is available) and con-

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STRETCH



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figure the cabling for the ports.

Insert and attach the floppy and hard disk drives.

Attach the keyboard and monitor.
 Then plug in the machine and take it for

a spin.

After entering the setup information as prompted from the machine's BIOS, you can boot the system with DOS 3.1. Run the FDISK and FORMAT programs from the floppy and you're off on a high-speed

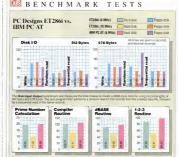
AT adventure.

For reasons still unclear to me, my first
PC Designs ET286i (it was also one of the

The most exhausting part of putting together the Red River Technology system was dealing with the

various product sources.

company's first production units) never worked properly. In a most accommodating manner, PC Designs supplied me (part by part) with a new power supply and then a new floppy disk drive. Still, inexplicable crashes occurred and infamous "Parity Check" messages appeared at irregular intervals. PC Designs sent the motherboard back to the manufacturer (ACS), which replaced the "high speed" chips. The machine was still unreliable, so PC Designs supplied a brand new ET286i kit from its stock. The machine worked perfectly until I tried to strap, or connect, the hard disk. Again, PC Designs came to my rescue and figured out, finally, that Seagate had changed the disk pinouts. The process was inconvenient, but I was never alone. When you buy the ET286i, you also appear to buy access to a service troubleshooter. (The company knew I was reviewing its computer kit and is unlikely to give such devoted personal attention to every customer. Still, the support I got was above and beyond what I expected, a good sign inasmuch as technical support can be as



The PC Designs ET286i shows blazing speed on the applications tests at both 6 and 10 Mhz. The disk It0 tasks, however, suggest poor integration between drive and controller: in the write and sequential read tests, the ET286's performance catually deteriorates at the higher speed.

difficult for established product reviewers to obtain as it is for others).

RED RIVER'S ATLAS The start-fromscratch approach is more complicated and fraught with potential difficulties—as well as with opportunities to customize. Red River offers its state-of-the-art ATlas technology in many configurations (see: sidebar "Motherboard Options from Red River Technology"); the price of each ortion

and the amount of time you must invest in construction varies accordingly.

Buying a motherboard and then purchasing separate components involves heavy telephone work. I spent 5 days racking up long-distance bills and securing price and product information before ordering a single item. The most exhausting part of parting together the Red Rixer system was dealing with the various product sources. In all, I obtained the mother-

IBM is the father.



But we're the mothers who do all the work.





All Aboard, June 1986





In 1981, IBM fathered a new breed of computer and called it personal (or PC for short).

called it personal (or PC for short).

In 1982 we not only started a company devoted totally to that personal computer, but stayed close to home and brought the little PC up.

We were first to devise a fully functional link between the IBM PC and the System 3X minicomputers. First to expand the PC's on-line storage and backup with removable Winchester cartridges. And we created the industry standard in backblane design for multifunction boards.

As you know, we're not the only ones who make products for the IBM PC. What you probably don't know is that all our products are developed by our own research and development team.

You see, our corporate commitment is to do more

than enhance the IBM PC. It's to genuinely advance it. Expanding memory, communications, graphics and disk capabilities.

We're IDEA. And if you want to know what's really happening with the IBM PC, don't call the father. Call the mother. At 800-257-5027.

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hard disk controller, serial and parallel ports, plus clock on one board.

What do you do when you buy an IBM XT and you want more power and versatility? You buy more boards.

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Well, we have a better way to use an XT. With All Aboard and Overboard. Two cards for the IBM XT. Each utilizes surface mount technology to give you all the functions on one board that you'd typically find on four. So you get everything you need in a single slot-and a single purchase. With open spaces for future options.

All Aboard is the first to combine mono/ color or EGA graphics, 2MB of EMS memory, multifunction capability and a disk controller.

It is the right card to buy if you are

serial and parallel ports, plus clock

on a short card.

installing a hard disk.

If you don't need a disk controller. Overboard is the perfect alternative. This short card is double-sided to combine graphics and multifunction capability for the XT. AT and

even the IBM PC.

Now when you buy an XT, you have only one decision to make. You can go All Aboard. Or you can go Overboard, Either way, you go with the company that's perfecting PC technology while the competition is merely talking about it. IDEAssociates. Call 800-257-5027.

board, a chassis, power supply, disk controller and floppy disk, hard disk, and keyboard from six different companies-and dealt with six sets of promises and problems. It took me well over 2 months to secure what I needed

Finding someone willing to sell a single AT motherboard is like trying to buy one egg at the supermarket. Numerous companies sell AT motherboards, but Red River Technology is one of the few that is willing to sell only one. Red River's A'Tlas Board. with AT specifications and an XT footprint, is a smart choice for anyone considering upgrading an XT, as well as for those who, for whatever reason, want to build a brand-new machine. The board also is attractive because it uses Chips and Technologics' PC AT-compatible CHIPSet (see sidebar "The CHIPSet Difference"), an innovative design that has had a major impact on the cost of new AT alternatives.

The ATlas motherhoard runs at three speeds (6, 8, and 10 MHz), but unlike the ET286i, it won't let you change speeds midstream; you must select the speed before you turn on the machine. The speedselect switch, like any switch on a PC motherboard, is hard to reach.

The ATlas comes with half a megabyte of memory; if you want to expand the memory to 1 megabyte without using a slot, a piggyback memoryboard is available. The memory chips were rated at 120 nanoseconds, which seems appropriate for a high-speed machine. The most prominent components on the motherboard are the five big chips that make up the Chips and Technologies CHIPSet, which are as impressive looking as the 286 microprocessor itself.

Less generous than the ACS board in the PC Designs machine, the ATlas motherboard has only one serial port and one parallel port. Three of its six slots are PC style and three are AT style. The batterypowered RAM works just like the one in an IBM PC AT. The Setup program of the AT Advanced Diagnostics is used to configure the machine. (Figure \$295 for IBM's Advanced Diagnostics into your system cost.)

Because of the power-saving features of the CHIPSet, the ATlas will work with a power supply as small as 135 watts, although you may need (or want) a larger

MOTHERBOARD OPTIONS FROM RED RIVER TECHNOLOGY

Buying an assembled motherboard and then building your own personal computer system guarantees a more flexible and personal machine-one, for example, that emphasizes graphics or scientific applications. Red River Technology offers its ATlas board in several stages of completeness at a variety of prices. Based on my own skills and 'time is money" criteria, I choose option 3. How about you?

Option 1: The adventurous PC user can purchase the naked ATlas motherboard, called the ATlas Bare Board Kit. The naked board is just that-a PC board without anything soldered in and without any components. You have to track down and purchase the chips and components before you lift the soldering iron.

Option 2: The next level is a naked motherboard plus a complete set of components-the ATlas Basic Kit or the ATlas Complete Kit. You still have to solder the pieces, but at least you have all the parts to work with. My memories of soldering my old CP/M system (a relatively simple two-layer board) are not pleasant, and new multilayer boards are even more

difficult to solder. Options 1 and 2 should only be considered if you have experience with a soldering iron, experience working with (and debugging) sophisticated electronics, and access to test equipment such as the Scope and Logic analyzer.

Option 3: The Red River Technology assembled and tested motherboard (the ATlas Board) offers a much more realistic level of kit building for most PC users. The board is guaranteed to work, and connectable components are available from numerous suppliers. Red River supplies a working motherboard; you

one if you are using power-hungry peripheral cards. The ATlas motherhoard will fit into a PC or an XT chassis, but many of the AT expansion boards you'll want to install are too tall to fit into a PC chassis. Fortu-



ATlas Board Kits Red River Technology 4001 W. Airport Preeway, #500 Bedford, TX 76201 (817) 571-5714

List Price: ATlas Bare Board Kit, \$199 (includes printed circuit board, manual, bly instructions). ATlas Basi Kit, \$595 (inch five gate arrays, 8-MHz 80286 CPU cl manual, and assembly instructions). ATlas BIOS, \$69 (includes PC AT-compatible BIOS plus 8742 with keyboard BIOS) ATlas Complete Kit, \$749 (includes all parts to build a standard ATlas board including gate arrays, 8-MHz 80286, all co nector sockets, TTL, and discrete parts sual and asse ATlas Complete Kit with BIOS, \$795 (includes all features of the ATIas Complete Kit plus the ATIas BIOS). ATIas Board for BC PC XT or BC AT \$1.5 ard for PC, PC-XT, or PC AT, \$1,595 (6, 8, and 10 MHz) or \$1,295 (6 and 8 MHz) (includes six ex connector spacing). ATlas System, \$2-195 (8 MHz) or \$3.095 (10 MHz) (includes an ATlas board with six I/O expansion slots, AT-compatible case and pos disk controller for floppy and hard disk, 1.2-Mbyte floppy, AT-compatible key-board, one serial and one parallel port, fully

have to supply everything else: case, power supply, keyboard, disk controller, disk drives, video display card, and vid-

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eo display monitor. Option 4: Like PC Designs, Red River also sells a completely assembled pretested machine, called the ATlas System. Red River stands behind every component; all you need to do is write a single check.-Robin Raskin

nately, the Soletek XT chassis that I purchased is as tall as an AT chassis.

I added a DTC hard/floppy high-performance disk controller, a Seagate 30-megabyte hard disk., and a Tandon floppy drive.



One board runs IBM.



One board runs the IBM AT.

Presenting the chief operating board of the IBM AT. IDEA Supermax/EMS. The only multifunction card for the AT with 4MB of RAM to support expanded, extended and conventional memory. Along with three standard I/O ports, two serial and one parallel.

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It took one board to create the IBM AT, but it takes another board to master it. IDEA Supermax/EMS, Call 800-257-5027 for more information.

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And just like our Diskit 2 drive, Diskit 2 Plus fits right under your PC monitor for zero footprint.

No other disk drive looks like it, or acts like it. Diskit 2 Plus with DES encryption.

What others can't see, can't hurt you.



 For some of the testing, I used a Hercules Color Card, but I also tried out the ATI Monographics card and several EGA

I placed everything in a sturdy, wellbult Selects (hip-top XT classis, along with a 135-watt power supply also purchased from Solchet. Since the ATlas motherboard has an XT footprint, I or creder an XT classis just to see an AT-class motherboard in an old-style box. The board also fits into an AT classis, undoubtedly a better way to go if you are assembling a machine from scratch. Your choice of chassis should take into account the periphenia you plan to mount. An XT

■ Holding my breath, I connected the power supply, speaker, CMOS battery, and keyboard to the ATlas motherboard. The speaker beeped politely.

or PC has screw holes on the side of the disk drives to attach them to the chassis. AT disk drives slide into the chassis on side-mounted rails and are secured by a screw in front.

ASSEMBLING HUMPTY DUMPTY Unlike the purchasing process, the assembly of my system was a refreshing breeze. Again, I unpacked and carefully inspected everything, this time with even more caution because I knew that no equivalent of the PC Designs troubleshooting team would be standing by to take my call or

hold my hand.

I held my breath until I actually saw the ATIas board slip into that XT chassis. But before actually installing the board, I tested the parts on my tabletop. While the PC Designs manual told all, the Red River material included plenty of information about the board but nothing about connect-

Red River Technology

Red River Technology's ATlas motherboard is a thing of beauty. Based on Chips and Technologies' PC AT-

compatible CHIPSet, the board uses 5 chips to replace the 36 chips on IBM's PC AT motherboard. The board fits into an XT chassis—a real plus for XT users who want to upgrade their machines.



2

Days spent scouring advertisements and investigating options resulted in the makings

resulted to the makings of a high performance/low cost machine. Shown here are (clockwise from top left): Solotek flip-top chassis with the Red River ATlas motherboard, which I installed, in place; power supply; 20-

installed, in place; power supply; 20megabyte hard disk drive; 360K-byte floppy drive; keyboard; battery and speaker; and disk controller card.

ing it anywhere. I was glad to have the assembled ET286i as a visual guide. Anyone attempting to build from parts should either memorize the inside of an AT or have

one close by for reference.

The considerably more dramatic building scenario for the ATlas went something like this:

power supply, speaker, CMOS battery, and keyboard to the motherboard. The speaker beeped politely.

■ More assertively, I then connected the display card and display. Success. When I turned on the monitor, it displayed the

memory-check messages.

Connecting the disk controller card and the floppy required some inventiveness.



3 Assembled the Red River ATlas-based machine essentially contains the same components as the PC Desiens machine, and it also takes about 2 hours to assemble. Selecting your own components gives you a more customized machine for approximately the same price, but ordering and waiting for parts-which can take weeks and weeks-requires

patience and a sense of

adventure.

The connectors on the controller card are numbered, but the DTC manual (a programmer's dream, a user's nightmare) doesn't give any clues as to which number is which. According to the DTC manual, the connectors are keyed; mine weren't. Neither were the corresponding cables.

I correctly assumed the orientation would be the same as for the PC Designs Western Digital controller. I lumed on the system and watched the memory diagnostics and floppy disk access light spring into the same of the s

■ I moved the floppy to smoother quatters and booted the system using IBM Advanced Diagnostics to configure it. I guessed the disk type configurations again based on my documented experience with the PC Designs. Then I booted to DOS from the floppy.

■ Finally I installed and formatted the hard disk, copied the system files onto the hard disk, and rebooted. At this point, my ATlas AT was still a tableton operation.

■ The question of what expansion board works in what system ought to be posed to victims of the next Spanish Inquisition.

■ To install the components, I measured the footprint of the motherboard and bolted the appropriate standoffs into the chassis. Since the Soletek chassis, like the ATlas motherboard, is designed for nunerous configurations, it is a true challenge to find a matching set of mounting boltes. Next, I bolted the motherboard and power supply onto the chassis.

■ Determined to be meticulous. I tried everything again with the disks still free-standing and playe in boards wobbling because the card guides weren't in place. ■ My greates confusion arose in assembling the front card guide/speaker holder. There were multiple screw holes and no instructions. The PC Designs kit arrived with all the brackets in place, with the So-



Red Kiter A Tlas-based System Lat Prices 13,325-2,615. Teach mother board-68 MHz, \$1,295,6810 MHz. \$1,595,6812 MHz. \$1,595,6812 MHz. \$1,595,6812 MHz. \$1,995,6812 MHz. \$1,995,6812 MHz. \$1,995,6812 MHz. \$1,995,8812 MHz. \$1,995,88

Microprocessor: 80286 Clock Speed: 6, 8, and 10 MHz or 6 and 8

In Short: A highly customized AT-compatible machine that is only slightly more complicated to assemble than a kit. Obtaining the components from various suppliers requires persistence and patience. CROSS MANUSE ACM SPRINGS CARD.

letek chassis, assembling the brackets was a lesson in trial and engineering.

With the parts in place and functioning, the end was in sight. I began to fasten and clamp everything down.

HARDWARE COMPATIBILITY The question of what expansion board works in what system ought to be posed to the vicinis of the next Spanish Inquisition. In theory, any board that works in an IBM TC and the companies by the companies of the companies

The dizzying world of 10 MHz is more confusing. Many expansion boards won't work on an IBM machine at 10 MHz, 41 though most do work at 8 MHz. (The standard IBM PC crawls along at 4.77 MHz, and the standard AT manages only 6. Some AT-compatibles and the newest version of the IBM PC AT clin Jono 28 8.)

With the ATI Monographics card installed in the ATIas Technology motherboard, I encountered several parity-check

Marvelous mi

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THE CHIPSet DIFFERENCE

A little company called Chips and Technologies leads the way in packing more AT performance into less space for a lower price.

IBM takes a traditional approach to building a PC AT motherboard. It uses a handful of high-tech chips—the 286 central processing unit, the memory, and the direct-memory access controller—plus a handful of low-tech "glue" chips. The glue chips perform a vital function, but their density is much lower than that of the high-tech chips.

Chipps and Technologies of Milipitas, California, has developed an alternative approach. Its five-chip PC AT-compatible CHIPSet replaces most of the glue chips in an AT or compatible machine. The CHIPSet design allows the mother-board to be smaller and also reduces board design time and nover consump-

tion. Chips and Technologies, incidentally, won a PC Magazine Technical Excellence Award last April for its EGA (enhanced graphics adapter) chip set, which has made possible the current spate of half-slot EGA boards. For more on these boards, see this issue's cover story.

Red River Technology, one of the first companies to incorporate the CHIP-Set into its product, offers an AT motherboard small enough to fit into a PC or XT chassis whose power consumption is low enough to run on an XT-style 135-wast power supply. Besides the market for new AT systems, the firm is targeting its AT motherboard at the existing PC-XT

market. By replacing your motherboard, you can upgrade an existing PC or XT and still retain your chassis, power supply, keyboard, and peripherals.

The CHIPSes difference is evident when you compare the motherboard from Red River Technology with the ACS motherboard used in the PC Designs ET286i machine. The ACS motherboard is the standard AT size, about 12 by 13 inches. It holds about 100 chips, not including the 36 memory chips and the ACS mother Technology board is pas 8 by puls 18 memory chips. The ACS River Technology board is pas 8 by puls 18 memory chips—the best best for a standard design with about two-thirds as many chips—Robin Raskin

WHERE TO FIND AT COMPONENTS

Building a customized AT-compatible machine from scratch requires some sophisticated price-comparison shopping. We've put together a list of a few of the mail-order companies hawking generic AT parts. You can also

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glance through the back pages of computer magazines to find companies advertising AT components. The best way to choose a mail-order product is, of course, by personal recommendation. If, however, you don't know anyone who

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BOOSTING COMPUTER CLOCK SPEEDS

You've heard a lot of conflicting stories about 8- and 10-MHz clock speeds—do they work with everything or not?

Contributing editor Winn L. Rosch gives you the scoop.

All personal computers have clock Agenerators. The primary purpose of these computer clocks is not to keep track of the time of day but to synchronize the operation of all the circuits inside the computer. The clock signal is a regular series of pulses; each clock pulse tells the computer circuits to make another decision. The faster the pulse rate, the faster the computer can process.

Although different sections of the computer may operate at different speeds, all operations are synchronized to the system clock. In the AT, the clock rate is determined by a quartz crystal; the clock speed is exactly one-half the frequency set by the crystal.

query set by the Crystal.

Computer Colocks cannot operate at any arbitrary speed. The clock rate must be within a narrow window, it must be fast enough to refresh the kind of memory chips most prevalent in PCs, which can remember data only for a fraction of a second. Also, the clock rate must be slower than the fastest speed at which semiconductor circuits in the computer can operate.

THE SPEED LIMIT The maximum operating speed of these solid-state logic circuits is determined during manufacture and depends on complex design considerations. In general, faster circuits must be either smaller or use greater electrical current or both. Either way, faster circuits are more difficult to design and manufacture.

errors while running at 10 MHz. These were the only times the machine crashed, so it seems appropriate to blame the distribution of the motherboard. Not all peripheral cards will work at 10 MHz, and cards that do may be accidents waiting to happen. The ATI Monographics card did appear to work reliably at 10 MHz in the PC Designs machine, and it worked reliably at 8 and 6 MHz in the Red River.

Not all of the components in a personal computer operate at the same speed; the microprocessor is usually the fastest. To keep it from outrunning the more laggardly components, such as chips on expunsion boards, the microprocessor is made to pusse briefly. These pauses are

called "wait states."

Another clock-speed limit is the circuitry of the computer itself. The higher the clock speed, the more critical the layout of the parts on the circuit board becomes. Faster circuit boards are also more difficult to design and make.

in the control of the speed limit of either the semiconductor chips or the circuit board is exceeded. When this happens, the computer cannot carry out one step of its thinking operation before the clock demands it to make another. Consequently, faster computers require faster chips and better overall designs, and arbitrathly increasing the speed of the system clock alone may not be successful. The original IBM Fe was probably designed to operate at 8 MHz (a clock on it readily accepted a boost to 8 from its initial 6-MHz settly accepted a boost to 8 from its initial 6-MHz settly.

Other computers, like the PC Designs ET286i, are designed to operate at higher speeds and, sometimes, without wait states. However, these machines must abide by the limits set by their semiconductor circuits. Not just the microprocessor, but all chips in the computer, must operate at the higher clock speed, includ-

The IBM EGA card didn't work in the Red River ATIsas at 10 MHz, even though it did work at 10 MHz in a souped-up IBM PC AT. Conversely, the Intel AboveBoard AT did work at 10 MHz in the Red River machine, although it didn't work in an IBM PC AT boosted to 10 MHz.

Before purchasing any AT-alternative kit or build-your-own parts, make sure that every peripheral you want to use will work

ing the chips on expansion boards.

The majority of expansion boards currently available for the AT operate well at 8 MHz. At speeds higher than about 9 MHz, most expansion boards become erratic.

COMPATIBILITY PROBLEMS Although high speeds might also cause software compatibility problems, most such difficulties arise from early copy-protection schemes. Since copy protection is generally being abandoned and most software is now clock speedindependent, software-compatibility issess are decreasing in importance. (The only remaining problem programs are games, some of which become impossiserances, some of which become impossi-

bly fast on high-performance personal

computers.)

The practical limit to computer operating speeds, therefore, is the ability of expansion products to handle high clock rates. With the increasing number of personal computers designed for operation above 8 MHz, peripheral vendors are boosting the speed ratings of their products, too. Switch-selectable speeds in a computer are a genuine blessing; the clock can be set to be computed with the computer are a genuine products become available, personal products become available.

Winn L. Rosch is a contributing editor of PC Magazine.

in that particular machine. The standard peripherals (display adapters, memory, multifunction boards) are a safe bet. But you should be inquisitive about networking cards, advanced graphics cards, and data acquisition systems.

SOFTWARE COMPATIBILITY Since not all hardware is created equal, not all software packages will run flawlessly on all machines. I tested several business packages, including dBASE II and III, 1-2-3, Microsoft Word, and SideKick, plus some packages that are notorious for giving the hardware a rough time: CopyWrite and Jet. The only problems I met were with copy-protected floppy disks.

On both machines, 1-2-3 and dBASE refused to start up at 10 MHz, claiming that the key disk was an unauthorized duplicate. In fact, both were the original distribution diskettes.

Both packages worked at 6 MHz. Results like these give the PC Designs machine an advantage, because you can start a timing-sensitive protected package at low speed and then switch into high speed

■ Despite the obstacles, building an AT kit is a worthwhile enterprise.

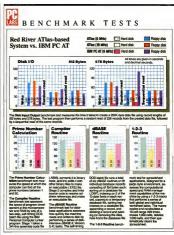
to operate the package.

In a similar vein, both machines had problems running the CoppWrite disk-daplication program. The symptoms varied according to speed, but at all speeds CopWrite was unable to duplicate a disk. Disk-copier programs, like copy-protected programs, rely on marginal, undocumentation of the disk in the IBM PC AT floopy-disk interface.

Pinball Construction Set is a riot at 10 MHz. The ball moves too fast to play, but it's fun to watch the demo. If you crave fast action, you'll love its Methedrine pace. Jet works nicely at 10 MHz.

Microsoft Word ran perfectly on the Red River system, but on the ET286i it was plagued by incorrect graphics characters. PC Designs is working on a solution.

FINISHING TOUCHES Despite the obstacles, kit building is a worthwhile enterprise. Anyone can conquer many of the available AT kits, and the resulting machines are good performers (see benchmark charts). The PC Magazine Labs benchmark-ter seults showed the PC Designs and the Red River machines running neck and neck a tooth 6 MHz and 10 MHz.



In comparing the Red River ATlas-based machine to a standard AT, one finds the greatest difference is in disk IO routines. At the same clock speed (6 MR), the ATlas performs faster; and, at 10 MR, disk IO improves only slightly, but the applications tasks run rouely 40 percent faster.

At 6 MHz, these machines are as fast as an IBM PC AT; at 10 MHz both machines are about 70 percent faster. Both were connected to Seagate hard disks, so it's not surprising that they showed similar muscle in disk-intensive benchmark testing.

Packaged kits like the ET286i are the perfect solution for the user who wants to save money, configure a marvelous system, and do some cursory exploration of the AT. The ATlas board is a natural for

anyone wishing to upgrade an XT, and the Red River "build from a board" option is ideal for maximum customization. Kits are attractive AT afternatives for

patient and price-conscious users who have a clear idea of their needs and won't mind tightening a few screws in order to get a personalized machine.

Robin Raskin is a frequent contributor to PC Magazine.



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OMMUNICATIONS The ET-286 plus is designed with communications in mind. There are three on-board serial ports that are configurable as either RS-422 or RS-232 depending on your application, 2 parallel ports further extend your communications ability. And then are still 8 expansion slots for additional I/O.

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companies.
The earliest forecasting programs available for the PC, based on mainframe versions, were difficult for anyone but FOR-TRAN programmers to use. Now, however, arich assortment exists, ranging from simple, menu-driven packages for people with little or no statistical training to comprehensive programs suitable for professional economists and statisticians. Even some of the most powerful programs are supersigned to the professional economists and statisticians. Even some of the most powerful programs are supersigned years to use.

The plentiful supply of forecasting software is a mixed blessing: with so many packages to choose among, your chances of happening on the right one are small and few people have the time to test each product. We've done that work for you, winnowing the field down to the 16 excellent packages reviewed below.

Each of the 16 packages is a valuable forecasting tool in is own category, and all are accurate in their calculations. They range in price from a slick template for 12-3 that sells for \$89.95 to the PC version of a mainframe package that will set you back \$1,500 if you buy all the available modules. Some are strictly but others reviewed will perform many other kinds of statistical chores as well. Most import Lotus's 12-3 or mainframe data files.

PREPARING A FORECAST Although forecasts focus on the future, they cannot be prepared in a vacuum. They must be based, to a large extent, on what has happened in the past: both the actual figures for past periods and a knowledge of the factors, such as poor product distribution or a sag in the economy, that influenced those flowers.

tnose tigures. Once you have gathered the appropriate history, you can graph the data. A graph is the easiest way to spot any underlying paterns such as seasonality or a sudden drop in sales that might have been caused by a strike at the manufacturing plant. Special statistical techniques are designed to deal with irregularities of these types; you with irregularities of these types; you



Each of the forecasting packages surveyed here is excellent in its category. For business forecasting use, however, the most impressive ones are those that limit their scope to forecasting and are either unusually easy to use or exceptional bargains.

If you already have 1-2-3 or Symphony, you can hardly go wrong by paying an extra 889.95 for the 1,2,3 Forecast! template. Even easier to use its SmartPorecasts II, though it is much more expensive. The third choice is Forecast Master, which gets the nod as a highly advanced program that can also be operated from menus.

would select an analysis model and make a trial run.

man time. See statistical procedure accounting the contenting to deforecasting, is used to determine if relationships exist between two sets of numbers—to what extent, for example, car sales depend on employment. The particular type of regression analysis employed in forecasting is the meseries, which assumes that the data used was gashered at evenly spaced intervals in time. Box-leniture or ARIMA modeling (for AutoRegressive Integrated Moving Control of the Control

statistics packages; its inclusion or absence in a forecasting program is sometimes used as a yardstick to size up a program's power. (For definitions of unfamiliar terms,

see glossary on the following page.)
Some PC-based statistical software also
includes spectral analysis (also called Fouier analysis in honor of a French mathematician of the early 19th century). This
method, originally applied to the physical
sciences, decomposes the data into a sum
of trigonometric components, creating a
waveform that is most appropriate for analyzing data with a pattern of repeating cycles.

How do you evaluate time-series output? Three clues will hely you determine the appropriateness of the model. First, took at the residuals, the difference obtained when you subtract the forecast or 'friend' values from the actual values. Residuals are often shown on graph as a series of does. If the dots have a completely random distribution, you may have picked to the property of the completely and the protained of the property of the protained of the property of the protained of the property of the protained of

massing troof you'requision amone at the rsquared value, called the "conefficient squared value, called the "conefficient determination." This value will be labeled or your printout to that it can be identified even by a beginner. It represents the percentage of the variation in the data that can be explained by the model. A value here of the contract of the fluctuations in the data over half of the fluctuation and the your ray be able to use the projected future values with some confidence.

But you must also check the size of the errors in the forecast. These are usually shown on the printout as SE, for "standard error," and MSE, the "mean squared error." These figures should be as small as possible.

SMOOTHING Using these indications, you continue adjusting and trying models until you have the best possible fit. You can "transform," or mathematically adjust, the data to account for seasonal differences, for example, One transformation.

the 'moving averages' technique, can replace a figure for one time period with the average of that period plus the periods immediately preceding and following; this technique 'smooths' the data to account for such irregularities in sales, for instance, as those caused by occasional sales contests or by television advertising that appears only every third month.

When you have the most appropriate model, you must still use your best judgment and your knowledge of current conditions to temper the projected figures you will pass on to others. A mistake could be very damaging; for example, your company could overproduce a product to meet an imaginary demand or self a division in the

mistaken belief that it would not remain | profitable.

Some of the packages reviewed here will perform all of the statistical steps automatically, resting the necessary formulas and even trying the data with several models, selecting the "winner" and displaying the forecast without requiring any interaction at all from you. Most of them will also permit advanced users to enter custom for-

HOW TO EVALUATE THE SOFT-WARE Before you choose a statistical package, consider the hardware requirements. Some programs make heavy demands, such as a full 640K bytes of RAM.

an 8087 chip, or a hard disk. One demands hard disk storage for 50 program disks to run the entire package. Some are limited to handling smaller data sets than others because they hold all of the data in RAM simultaneously for maximum speed of calculation.

Pay attention to the level of expertise required of you. Although many of the programs come with excellent manuals and interactive, on-line tutorials, some assume a certain level of knowledge. Most econometric packages expect you to have experience in preparing forecasts based in part on economic tends and data, as well as a general knowledge of statistical procedures.

A FEW DEFINITIONS FOR NONSTATISTICIANS

mulac

Box-Jenkins One of a class of models called ARIMA, for AutoRegressive Integrated Moving Average. Identifies possible useful models and checks each in turn against the time series until it finds the

one that fits.

Case See Observation.

Confidence interval A group of values used to estimate a statistical parameter. The confidence interval tends to include the true value of the parameter a predetermined proportion of the time (for instance, 90 percent) if the process of finding the group of values is repeated a

number of times.

Data points The number of values a statistical software package can process in a procedure at one time. Often, the allowable number of data points is equal to the number of variables allowed multiplied by the number of observations allowed. Deseasonalization A method for removing any seasonal fluctuations that may distort the meaning of the data.

Differencing A method of taking out seasonality by subtracting the second data point from the first, the third from the second, and so on.

Durbin-Watson figure A model that determines if the variables in the equation are serially correlated, a condition that casts doubt on the reliability of the foreEconometrics The application of statistical methods to the study of economic

Eigenvalue A scalar associated with a given linear transformation of a vector space.

space.

Exponential smoothing A method of transforming time series data for a better

fit by creating a weighted average.
Fourier analysis See Spectral analysis.
Iterative Refers to mathematical procedures that find an optimum figure by performing repeated calculations dealing with the same data.

Lag in regression calculations, observations for one of the variables may be "lagged" or shifted by one or more time periods to achieve a more realistic comparison between the variables. For insunce, an advertising expenditure this month may affect sales for next menth. Least squares A basic method of fitting a repression line mathematically so that the sum of the squared errors is smaller than any other straight-line model.

than any other straight-line model.

Moving average A method for using the
average of past forecasting errors to calculate new forecasts.

Observation An individual value recorded for a variable. In a list showing monthly telephone expenses for a year, the amount of the bill for any one month would constitute an observation. Regression An analysis that expresses a dependent variable as the result of a formula approximation involving one or more independent variables.

more independent variables.

Residuals The difference obtained when you subtract the forecast or "fined" val-

ues from the actual values.

Spectral analysis Decomposing the data into a sum of trigonometric components to create a waveform that is most appropriate for analyzing data with a pattern of

repeating cycles.

State space A forecasting technique that exploits the relationship of time series techniques to an advanced procedure

called canonical correlation analysis. Time series The type of regression analysis employed in forecasting. It assumes that the data used was gathered at even spaced intervals in time. Box-Jenkins is an advanced form of time series analysis. Transformation A mathematical adjustment made to a set of figures to improve the fit of the regression line.

Value Each of the weekly numbers for the variable "sales tax" used as an example in the following definition would be called a value. See also Variable.

Variable A number whose value may change. In practice, the group of numbers belonging to a particular item in a data set—for example, a collection of weekly figures for "sales tax." Programs that incorporate a programming language may be able to crunch advanced statistical models beyond those specified in the manual. To take advantage of these capabilities, you must be able to write complicated algorithms to add to the command structure. On the other hand, some of the menu-driven packages require

no math knowledge at all.
Whatever business you're in, it's likely
that a forecasting package will be able to
help you. To let you try before you buy,
most statistical software publishers sell inexpensive demonstration versions or supply evaluation copies to legitimate prospoets. After you buy a package, you're not
alone: most publishers offer technical support that is prompt, skilled, and most
proport that is prompt, skilled, and for

1.2.3 FORECAST!

Bruce Gates, the statistics professor who wrote 1,2,3 Forecast!, is one of the rare university guns with a true business orientation. In 1,2,3 Forecast! he has created a template that enables people who've never seen a statistics textbook to produce usable forecasts. All you have to do is follow the lucid utorials in the manual and read the choices on the menus.

Don't let the program's simplicity fool you, however: 1,2,3 Forecast! is no toy. Large businesses prefer it to packages costing thousands of dollars.

Thanks to Gates's accurate formulas and the power of Lotus's software (versions are available for all releases of 1-2-3





Bruce L. Gates
P.O. Box 12582
Salem, OR 97309
(503) 585-8314
List Price: \$89.95
Requires: 512K
RAM, two disk driver
r, 1-2-3 or Symphony.

DOS 2.0 or later, 1-2-3 or Symphony, In Short: An inexpensive menu-driven Lotus template that lets users on any level, with or without statistical experience, create forecasts. Not copy protected. GPGL 566 ON FEACHS STATOS CAND.

Market

Ecosoft Inc. 6413 N. College Ave. Indianapolis, IN 46220 (317) 255-6476 List Price: \$375 Requires: 128K RAM, one disk drive,

DOS 1.0 or later.

In Short: A basic menu-driven, general statistical package that handles forecasting smoothly but lacks many sophisticated procedures. The program is easy to use and highly accurate but requires a knowledge of statistics. Not copy protected.

OFFICE SECUREMENT STRUC CHECK

and for Symphony), you can see your results almost instantly on 1,2,3 Forecast's prepared worksheets or in graphs. The program's major limitation is its scope: it can handle only ten independent variables and a maximum of 150 observations.

maximum of 150 observations.

1.2.3 Forecast! adjusts for seasons up

to 30 periods in length and automatically evaluates the significance of its calculations. It includes complete arithmetic times. It includes complete arithmetic encing (a method of taking our seasonality) substracting he second data point from the first, the third from the second, and so [1, with calculate a Durbin-Waston figure, which helps determine if the variables in the equation are serially correlated that is, if this month's figures depend on constraint of the control of the

You can import named ranges from a worksheet for use as data or input the required numbers from the keyboard. Error messages and warnings will prevent you from making several statistical errors, such as forecasting too far ahead with insufficient historical periods. Altogether, 1,2,3 Forecast is a good value.

MICROSTAT

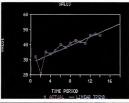
Microstat is a complete statistics package with many other features beyond its forecasting capabilities. Despite its thoroughness, though, it is a relatively inexpensive piece of software.

Microstar assumes that you know how to create a forecast. However, you don't need to know the software well to generate forecasts; someone completely unfamiliar with Microstar could follow the clear menus and obtain useful output. The manual is clear on the operation of the program, although it offers no training in statistics.

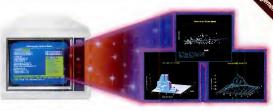
In addition to time series, Microstat will do descriptive statistics, hypothesisting, crosstatistics and chi-squares, and other frequently used procedures. More than 30 kinds of data transformations can be selected from a menu. Moving averages, descasonalization, and exponential smoothing can all be employed to achieve a better forecast.

Microstat is an excellent, straightforward package. It will print out presentable graphs that include appropriate statistical figures at the bottom. It can use large data sets. Although it doesn't offer many sophisticated procedures, Microstat will meet all business forcasting and some even more specialized needs.





STATGRAPHICS



Powerful Statistics, Sophisticated Graphics In One Complete Software System

STATGRAPHICS from STSC is simply the most complete and powerful statistical software available for your PC STATGRAPHICS Integrates powerful statistics with high-resolution color graphics-in one single software system—to give you an extraordinarily powerful analytical environment.

"ISTATGRAPHICSI is unusually complete as software systems go in terms of statistical capabilities."

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"Verdict: ISTATGRAPHICS isl a model PC software system which will set standards for PC statistical software." (PC Heer Manari

STATGRAPHICS offers you a wide variety of graphics capabilities to help you visually analyze your data-more ontions and more sophistication than any other PC statistical software. Included are histograms, two- and three-dimensional line and surface plots, scatter plots, time

sequence plots, quality control charts, as well as bar and pie charts. STATGRAPHICS supports a wide range of graphics boards, printers, and plotters.

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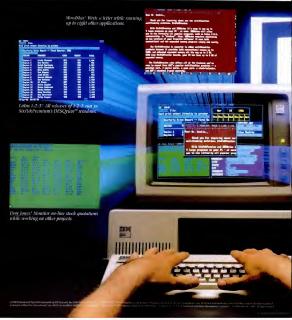


rices slightly higher, STATGRAPHICS.

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EXEC*U*STAT

Exec*U*Stat is a general-purpose forecasting program for the busy executive. It's one of the best examples around of a full-featured program that is accessible to someone with little background in the discipline. In fact, it makes an effort to educate you as you go alone.

For example, in the statistical world, "nonparametric procedures" are those used with samples when you don't want to make the assumption that they came from a "normal distribution." One of these procedures is called a "Wilcoxon signed rank test for paired samples." That name wouldn't mean a thing to someone with lit-

■ Exec*U*Stat's
help screens actually
teach you the principles
involved in each
procedure.

tle or no statistics background, nor would the name of the category of statistics involved. So Exex*U*Stat lists the procedure on its menu as "testing for a difference between two samples"; the menu also shows the correct statistical designation undermeath.

Exec*U*Stat's help screens actually teach you the principles involved in each procedure and tell you what results are considered good or bad. Although the program doesn't include every feature professional statisticians might want, it's surprisingly complete. To such standard forecasting tools as descriptive methods and hypothesis testing, it adds a number of forecasting procedures, including the generation of seasonal subseries plots, a feature not found in most packages. This graph illustrates the average of each season with a horizontal line. Vertical lines that run from each data value to its corresponding seasonal average help you discern patterns. Exec*U*Stat's graphics, on the whole, are excellent.

The program handles financial forecasting with such features as internal rate of return and depreciation curves. An Executive Desk module included with the package adds a calculator, calendar, telephone book, alarm clock, and scratch pad. Exec*0*USari's biggest drawback is its 2-minute loading time. After that, it moves at a reasonable clip.

MINITAB

Minitab was originally developed in 1972 as a tool for teaching statistics to university students. It has been used extensively on both minis and micros.

The current PC version, which has file added 1994, will make those who 've used mainframe terminals feel confortable and right at home. It gives you the current due when you sign on and then waits for you to suse a command. The command language uses English words for the most part, but it will still alse getting used to. For example, if you want to leave the program, you're will still alse getting "quil" or "end" or "firmin," but only the command "stop" will get you out of the package. Although will get you do if the package. Although use of the Minitab you must learn the commands.

The documentation is good, and if you want to go further, you can buy two additional books that will help you learn the program and teach you statistics as well: a Minitab student handbook, complete with exercises, and Statistics for Business with Minitab.

Minitab's time series forecasting module was added recently and is not covered in the handbook. It includes the Box-Jenkins methodology, a procedure popular with advanced statisticians that is generally found in only the most-sophisticated packages. Some of the more-advanced transformations, however, are not avail-

The package has a definite mainframe "feel." The graphs it produces are composed of letters of the alphabet. The screen display is black and white. However, you can get color by using your ANSI driver through a BASIC program to change your screen colors at the DOS level or by using The Norton Utilities program that accom-



EXEC-0-STAT

Exce*U*Stat Inc. Research Park, 2 Wall St. Princeton, NJ 08540 (609) 924-9357 List Price: \$495

RAM, two disk drives, DOS 2.0 or later, color/graphics card.
In Short: An excellent, full-featured package for the beginner. Completely menudriven, with help screens that teach statistical theory. Copy protected.

OPCLE ##40/PRADER SERVICE CARD



Minitab Inc. 3081 Enterprise Dr. State College, PA 16801 (814) 238-3280 List Price: \$1,000 C'fundamental'' ver-

sion, \$500) Requires: 320K RAM, two disk drives, DOS 2-0 or later.

In Short: A general, uncomplicated puckage with a mainframe feel that hits the main areas of statistics with little depth. A command-driven approach makes Minitab somewhat difficult to learn, but supporting exthooks are available. Copy protected. CROLE 603 OMERAGER SERVICE CARD



SmartForecasts II Smart Software Inc. 392 Concord Ave. Belmont, MA 02178 (617) 489-2743 List Price: 5695 ("Trainer" version.

S100 Sequence S1

plishes the same purpose.

Minitab is a reliable program that can introduce you to many forecasting procedures. A "fundamental" version aimed at statistics novices is also available; priced at \$500, it is considerably less expensive than the advanced version and may meet your needs.

10MHZ RRT/AT



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Hercules compatible monochrome graphics card: \$149 1.2 MEG floopy disk \$179 360K floppy disk: \$109 CIRCLE 277 ON READER SERVICE CARD





SMARTFORECASTS II

SmartForecasts II. strictly a forecasting program, lives up to its name. This cleverly concocted program uses a command language with a welcome twist: the choices available are shown at the bottom of the screen at all times, eliminating all

FACT FILE Statoro Penton Software Inc. 420 Lexington Ave., aph F3=table F4=rank F5=prnt 7&9=save.results(Press Enter) #2846 New York NY 10017 (212) 878-9600 memory work while you learn the pack-

even easier

age. Tutorials make the learning process

tions automatically from your data: the

program conducts a "tournament," pit-

ting various forecast models against each

other. It then graphs the winner automati-

cally, but it also shows you the other meth-

ods it tried, along with the percentages by

which they were proven inferior to the

Read command, you can go immediately

into forecast mode, in which your choices

include several professional techniques in

addition to the automatic process de-

scribed above. Beautiful graphs in vivid

colors will appear on color monitors, com-

plete with the confidence interval in a dif-

ferent color. Help screens teach statistical

gram for the novice. It does not include ad-

vanced procedures such as Box-Jenkins.

but it wasn't written for a sophisticated

SmartForecasts II is a landmark pro-

Once you load your data file with the

winner for the data in question.

theory and give examples.

SmartForecasts II can make predic-

Winters (10%, 10%, 10%, 4, Mul)

If you wish. SmartForecasts II will automatically pit various forecast models against each other and show you only the result of its work. The end product is a vivid graph like this one

The confidence interval appears in yellow at the right of the plot.

List Price: \$795 Requires: 256K

RAM, two disk drives, DOS 2.0 or later. color/graphics card In Short: A complete, high-level statistics nackage, with menus and documentation to help those who don't know statistics get around. Statpro has unusual graphics capubilities. Copy protected.

CIRCLE 661 ON READER SERVICE CARD DOS 2.0 or later

SYSTAT SYSTAT Inc 2902 Central St Evanston, IL 60201 (312) 864-5670 List Price: \$595 Requires: 256K RAM, two disk drives,

In Short: SYSTAT is a highly regarded general statistics package with powerful forecasting abilities. A good manual makes knowledge. Copy protected (unprotected

it usable by people with limited statistic version, \$10 extra). CIRCLE 640 ON PEADER SERVICE CARD



- BMDPC BMDP Statistical Software Inc. 1964 Westwood Blvd., #202 Los Angeles, CA

90025 (213) 475-5700 List Price: \$450 to \$1500 Requires: 640K RAM, 5-Mbyte hard disk drive, 8087 math coprocessor chip, DOS

2.0 or later. In Short: A comprehensive mainframe package now available for PCs. Separate modules let you choose the specific procedures you need. Copy protected CIRCLE 679 ON READER SERVICE CARD

be pleasantly surprised at the depth of the choices presented.

Statoro's time series capabilities include graphing Box-Jenkins identifications. Other forecasting options are moving averages and variances; additive or multiplicative seasonal series analysis; exponential smoothing; multistage, polynomial, and trigonometric least-squares procedures; and multiplicative decomposition, which breaks the data into components for further study. For what-if

analysis you can even duplicate records

with dummy incremental fields. Statoro offers advanced multivariate algorithms for cluster and factor analysis, canonical correlation, matrix determinants and inverses, discriminant function analysis, and multiple contingency analysis, to mention a few. Its procedures, like crosstabs, are full-featured: calculations are included in the printout for Cramer's V, column- and row-variable-dependent lambdas. Fisher's exact test, and other operations with strange names dear to the hearts of statisticians.

Statpro's graphs are amazing in their scope: unusual types such as circular star plots and Andrew's Fourier plots are offered as a matter of course. The program draws plots of mathematical functions and will allow such niceties as the superimposition of one regression line on top of another.

This versatile package provides for replacement of default formulas with ones of your own choosing. In fact, you can create a library of up to 300 custom data conver-

STATPRO

market.

Menu-driven Statpro is a worthy candidate for the company that wants to buy one statistical package that everybody can use. A manual and a textbook are available to teach those who don't know statistics. Those who do know what they want can find it quickly through the menus and will sions that you can use at will.

If you're in the market for a generalpurpose stat program, Statpro is first-rate.

SYSTAT

SYSTAT, the brainchild of Professor Land Wilkinson, has attracted a real following over the years for what was originally intended as a PC substitute for mainframe programs. While most of those mainframe packages are now showing up in PC versions, SYSTAT has expanded in the other direction and is now itself in use on some of the big machines.

Like other sophisticated statistical programs—the kind statisticians love—5YS-TAT may be more complicated than people with a limited math and statistics background will want. But SYSTAT has a big, fat manual to help you, and the program's forecasting power makes it worthwhile to wade through the manual.

SYSTAT's forecasting capabilities encompass two general types of procedures, "time domain," which covers forecasting techniques like Box-Jenkins, and "frequency domain," or spectral analysis.

Recent additions have included a full discriminant analysis module, cluster analysis, and a nonlinear module with leastsquares, logit, probit, and other nonlinear models. It also has the less esoteric formulas for descriptive statistics and other techniques readily understood by those without doctorates in statistics.

SYSTAT uses a command language that you must learn in order to best use the package. If you do make the effort to master this program, you'll find it rewarding.

BMDPC

This general statistical package originated on a UCLA mainframe in 1961 under the direction of Professor W. J. Dixon, who still guides its development. The complete program consists of 40 procedures, of which 29 are available for the PC (though the procedures can be purchased in smaller "groups"). The full 29 modules occupy 50 floppy disks.

Like SYSTAT, BMDPC boasts both spectral analysis and time series for forecasting, including the Box-Jenkins techniques. A giant manual with very small type explains the theory behind each procedure and the computing steps necessary to accomplish it, with examples.

The king-sized program will make you feel like you're working on a mainframe, both in the way the commands work and in styles. The advantage to this arrangement

the tremendous scope of the applications available. Famous statisticians have donated their time to the development of the various modules, which makes BMDPC seem more like a collection of procedures than a unified program. Even the manual was written by many authors in many different

Summary of Features								
Product	List price	***	Command ar mena driven	BOS7 coprocessor	Variables		Data points	Box-Jenkins
1,2,3 Forecast!	\$89.95	Forecast	Menu	Supported	10	150	1,500	No
RATS	\$200	Econo- metric	Command	Supported	•		45,000	Yes
Gauss	\$250	Econo- metric	Command	Required	90	100,000	t	By Iormui
Microstat	\$375	General	Menu	No	80	400	32,000	No
SMOPC	\$450- \$1,500	General	Command	Required	•	•	64K RAM	Yes
Exec"U"Stat	\$495	General	Command	Supported			4,000	No
Forecast Plus	\$595	Forecast	Menu	Supported	30	1,000	30,000	Yes
microTSP	\$595	Econo- metric	Command	Supported	300		32,000	Yes
SORITEC	\$595	Econo- metric	Command	Required	85	100	8,500	Yes
SYSTAT	\$595	General	Command	Supported	200	t	t	Yes
Smart- Forecasts II	\$695	Forecast	Menu	No	45	165	7,425	No
ESP	\$795	Econo- metric	Command	Supported	10	1,000	8,000	Yes
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■ BUSINESS FORECASTING

is that each module is written and explained by an expert in that procedure. Too often, programs have noticeable weaknesses when authors and programmers stray beyond their personal areas of expertise in an attempt to cover the entire field.

This is not a problem here.

Taken as whole, BMDPC is top-notch
work. It's a huge statistical system in
which you could theorecitally lose yourself forever, and additional modules will
be added from the mainframe version as
time goes by. Since any module can be installed individually, you can limit your
hard disk storage to the procedures you use
regularly. Some single procedures occupy
them on a hard disk, they are rejvined by a
social utility included with the provided with

BMDPC has life tables and survival analysis modules of interest to medical and insurance professionals, a feature not offered by most competitors.

This program is another one that comes in black and white but will accept any screen colors you care to impose through DOS. If your statistical work covers the whole gamut of procedures, not just forecasting, you'll need a complete package. This is the most complete one around.

RATS

The catchy name RATS stands for Regression Analysis of Time Series, but this soon Analysis of Time Series, but this econometric forecasting package's literature abounds in cartoons featuring package's literature abounds in cartoons featuring pain and for the advanced procedures it offers abaility to handle large data sets, for its flexibility, and for the advanced procedures it offers, and all the color statistical grack-At least one of the other statistical grack-At least one of the other statistical grack-agas reviewed here admits (with proper credit offered) that it uses algorithms developed by Robert Litterman, one of RATS's two auditors.

RATS has had a reputation for being hard to learn. Now VAR Econometrics has added E-Z-RATS, which will write applications in the RATS programming language automatically from menus. You don't even have to read the 300-page manual to use it. This arrangement offers the best of both worlds: novices don't have to choose between buying a low-powered package they can handle but will soon out-



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Vn Ball List Price: \$200 (demo \$40) Requires: 256K RAM, two disk drives, DOS 2.0 or later, color/graphics card. In Short: A state-of-the-art econometries peakage with a nationatic applications generator. RATS is command-driven with programming language. Comes with E-Z-RATS for novices. Not copy protected.

GAUSS' Applied Technical Systems P.O. Box 6487 Kees, WA 99064 (200) 631-6679 List Price: \$250 Requires: \$256 Keessires: \$256 K

RAM, one disk drive, DOS 2.0 or later, 8087 or 80287 mush coprocessor. In Short: An advanced package employing a programming language based on matrix algebra. Heavy mush background is required. Not copy protected.

grow or purchasing a sophisticated program it will take forever to learn. They can get started doing real work with E-Z-RATS while studying the RATS language on the side.

RATS can import or export 1-2-3 worksheet files directly, in addition to recognizing ASCII, DIF, and other standard formats. You can also buy a Cambridge Planning macroeconomic database for it that includes 188 frequently used time series that can be updated monthly. Full spectral analysis capabilities are among its forecasting features, which also include two- and three-stage least-squares, probit and logit models, and the Kalman Filter for estimating state-space models. State space is a forecasting technique that exploits the relationship of time series techniques to an advanced procedure called canonical correlation analysis.

A RATS version that can accommodate up to 7,800 double-precision numbers with 14 digits of accuracy is available for only \$200. The large version is \$100 more and ups the file size to 45,000 data points. Both are outstanding values if you're looking for a friendly, command-driven package with a versatile language and state-of-the-art forceasting procedures.

GAUSS

Like RATS, Gauss is inexpensive and powerful. It's not for beginners unless they have a heavy math background. Forecasting with Gauss requires a comprehensive knowledge of algerbra—not the common, garden variety most of us had in high school, but matrix algebra. Mathematicians find it a delight.

The basic unit of its programming lan-



Gauss is an advanced statistical program for users with strong math backgrounds. This screen illustrates a singular value decomposition with eigenvalues—heavy stuff, for the higher-math crowd only.

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Alliance also sells a \$575 portable backup system similar to the Maynard Maynstream that can be moved from one office to another to back up any number of XT's and AT's. 60MB cartridge tape systems (similar to Everex's la

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Alliance Technology, Inc. 510 Lawrence Expy, Suite 210, Sunnyvale, CA 94086. (800) 621-0854 ext. 700 or (408) 727-6200. CIRCLE 499 ON READER SERVICE CARD.

guage is a matrix. Users accustomed to higher math will find it easy to learn because the commands employ formulas with standard syntax. Gauss will process giant data sets and requires an 8087 chip to do its work. The numerical algorithms are coded in assembly language, and the program is much faster than the IBM APL language. It will create a 50 by 50 matrix of uniform random numbers in less than half a second.

Gauss has a built-in, full-screen editor and dozens of applications programs for many popular procedures. These procedures include four optimization algorithms, options for computing gradients, and a maximum likelihood module. The versatility of the language makes it a valuable tool for a host of statistical purposes in



Graphics are well integrated into ESP. a solid econometrics package. This useful graph shows a regression line and residuals.

addition to forecasting.

The developers are working on a mer driven program to increase the base of potential Gauss users.

FORECAST MASTER

Forecast Master is one package that does not force you to enter the developer's tight little world or learn the developer's language in order to express preferences. The software runs entirely through colorful menus, with soundly based defaults available to guide beginners. Advanced users can enter their own formulas. The result is little short of a miracle when you consider that its author is dealing with some of the most advanced material in the forecasting field

Forecast Master was written by Dr. Robert L. Goodrich, who received his Ph.D. in stochastic systems from Harvard. Most people don't even know what "stochastic" means (the adjective implies the presence of a random variable). He has written many papers on time series analysis and is the coauthor of a key algorithm in the field of state space. The publisher of Forecast Master is Scientific Systems Inc., whose president, Dr. Raman K. Mehra, developed a pioneering state-space algorithm in conjunction with H. Akaike.

State space is only one of seven forecasting models from which you can choose. The others are Box-Jenkins. Bayesian vector autoregression, AUTO-PRO regression (an econometric module

designed by Engle and Grainger of the University of California, San Diego), seasonal decomposition, exponential smoothing, and curve fitting. The last two techniques will permit the use of samples as small as ten observations.

Forecast Master includes excellent integrated graphics and even lets you specify and use your own word processor or editor within the program to create or edit data files. An audit trail preserves all matrices calculated.

Although it doesn't offer spectral analysis, Forecast Master is highly recommended for those who want the ultimate in an easy-to-use time-series program that doesn't sacrifice thoroughness or power.

ESP

The letters ESP stand for Econometric Software Package, and ESP is one of the standard offerings in the field. The software was acquired recently by Economica, a firm that also has several subscription data packages relating to the economy. The basic \$795 version permits you to forecast single-equation models; the \$1,295 model-simulation version for solving multiequation models will handle up to 256 equations.

ESP is command-driven and comes with good documentation and tutorials to get you started. Its advanced capabilities include three-stage least-squares problems and nothinear estimation using the Gauss-Seidel solution technique.

CT FILE

Forecast Master Scientific Systems Inc One Alewife Pl. 35 Cambridgepark Dr. Cambridge, MA 02140 (617) 661-6364 List Price: \$795 aires: 512K RAM, one disk drive.

DOS 2.0 or later, color/graphics card, 8087 coprocessor recommended. In Short: An impressive combination of advanced forecasting procedures with menus to guide the novice. Not copy pro-CIPICLE 676 ON READER SERVICE CARD ESP



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The program has several convenient features not found in most packages. For example, you can stop a work session at any point and resume it later. You can halt an iterative process as often as you wish to examine the value of a variable and identify equations that do not converge. You can also execute any other program from within ESP.

Excellent graphics are well integrated into the program. Data can be entered from the keyboard, or you can import ASCII, DIF, SYLK, 1-2-3, or Symphony files. Up to 1,000 series can be accessed at any one

Economists will be very comfortable with ESP once they've learned the language. Those with little or no econometric training will have to work harder to master the program.

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IFPS/Personal is a forecasting package of another breed. Its emphasis is on the finan-

cial aspects of business decision making. stressing what-if analysis and goal seeking, and it is, in fact, built around a spreadsheet. Built-in software support lets this personal computer version of IFPS communicate with its celebrated mainframe version.

The IFPS/Personal language has functions that will generate standard statistical procedures. For instance, the Trend command will cause the program to perform a linear regression. Other functions will figure continuous rate of return, compound growth rate, internal rate of return, net present value, net terminal value, and other figures of interest to the corporate controller. The program offers automatic solution of simultaneous equations and logical consolidation of complex models and data. A macro facility will let you create your own commands in addition to those the nackage offers.

The documentation consists of two fat manuals in a standard-height slipcase. One book is primarily an explanation of the language and a command summary. The other book is devoted entirely to a series of tutorials. IFPS is easy to use, particularly if you are familiar with spreadsheet programs. The slick color graphics and reports IFPS generates are appropriate for business presentations.

FORECAST PLUS

The structure of Forecast Plus is so logical that it could serve as a model for designing





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color/graphics card. Mainframe software In Short: A financial forecasting package with spreadsheet capabilities and an emphasis on goal seeking. The PC version can communicate with the popular mainframe version. Copy protected

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DOS 1.1 or later. In Short: Sequential menus lead the user through the steps to create accurate fore casts and sophisticated output. The manual has excellent tutorial material on statistics. Not copy protected.

forecasting tools. You are advised to gather your data, create a file, and then use the "exploratory package" to find the best technique to fit the data you have. You run that technique from the "forecasting package" and rerun it with modifications until you have the optimum results. The manual is so clear on every point that it could easily double as a beginner's forecasting textbook.

For example, one notable section of the documentation shows small printouts of different regression patterns. Each pattern is labeled, with the suggested procedures to follow conveniently listed beside the graph. For the printout marked "No Trend-Additive Seasonality," the documentation suggests that you try the following "cures": Harrison's harmonic smoothing (a variation on our spectral analysis or Fourier analysis), Winter's sea-

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sonal smoothing, robust decomposition, generalized adaptive filtering, and Box-Jenkins analysis.

Forecast Plus was written by David Walonick, who is also responsible for Statpac and Goodness of Fit, two other widely accepted statistical packages. Forecast Plus presently runs only in black and white. Menu-driven throughout, this forecasting package is a praiseworthy accomplishment.

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STATES BOOK TOTAL

In microTSP, a comprehensive and sophisticated econometrics pack ported from a mainframe environment, data and graphics are well integrated. In this example, residual figures are shown on the right, next to a scrolling plot of the data.

ute it to all of your friends. The free program in question is The SORITEC Sampler, a fully functional subset of The Sorites Group's more comprehensive SORITEC package. This subset alone is comparable to other econometric programs costing hundreds of dollars. Why does The Sorites Group give it away? To demonstrate the advantages of its language and to interest you in its complete package, which was developed in 1978 and is now installed on 22 different kinds of mainframe, mini, and micro systems. The SORITEC Sampler includes an 88-page manual that you print out from a disk.

The complete \$595 version of SORI-TEC will process multiple-equation models, including static or dynamic simulation and solutions of nonlinear sets of simultaneous equations. It also manages Fourier transform methods maximum-likelihood estimation, three-stage least-squares, and financial functions such as the interpolation and derivation of capital stock series with the derivation of related statistics such as depreciation and net capital investment. A color/graphics module has recently been added.

The manual is thorough but makes it quite clear-to the point of carrying a disclaimer-that it is not intended as a textbook to teach you either statistics or economics. It does, however, suggest sources from which you can gain this necessary background.

microTSP

The TSP in microTSP stands for Time Series Processor, and micro means that it's the PC version of yet another mainframe



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■ BUSINESS FORECASTING

original. The micro version is no newcomer either; Quantitative Micro Software is up to Version 5.0, and the program has most of the sophisticated features econometrics buffs want, including financial

analysis and simulation. The program was written by one author, David Lilien, and so it has a nice coherence missing from some software packages that were created by committee. Quantitative Micro Software included and good-sized on-secrem totarial in the dotspood-sized on-secrem totarial in the white, but you can specify colon for a specify colon for actual package. The documentation itself in divided into an introductory section, some excellent case studies, a command reference section, and a group of formations called "narrative description" that explain and procedural requirements of the major model and procedural requirements of the major model.

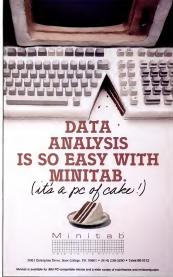
 Quantitative Micro Software's microTSP has most of the sophisticated features econometrics buffs want, including financial analysis and simulation.

providing the necessary operational information. The manual is printed on excellent paper, actually card stock, which is a refreshing contrast to the tissue-thin pages of some other manuals.

microTSP's command structure consists largely of truncated English words combined into strings. Although the log created by a microTSP session through its Trace command might look a bit like gibberish at first glance, it shouldn't take you very long to get the hang of microTSP's vocabulary.

The most recent version of microTSP's data editor allows the estimation of probit and logit models, but this otherwise complete package does not offer spectral analysis as yet.

Marvin Bryan is vice president of strategic planning and research for one of the nation's leading advertising agencies and supervises microcomputer operation in his department. He has written many articles on computing and is a member of the American Statistical Association.



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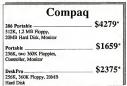
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The Second Annual PC Magazine Awards for ΓECHNICAL 🚇 EXCELLENCE

PLEASE

n an industry increasingly driven by well-financed efforts to dominate existing market niches rather than carve out new ones, where the exigencies of big-buck

marketing commonly triumph over innovation, the editors of PC Magazine once again salute the few genuine examples of breakthrough design and engineering.

Of the more than 1,000 products we tested and reviewed last year, too many were just tired copies of one another. All-toosimilar modems, memory boards, _ printers, database managers,

and word processors crowded dealers' shelves vying for your attention. Very few exhibited the flashes of technological insight that can truly Nestled in velvet, the prized silver advance your productivity. And too often these medallions awaited announcement of this advances remained submerged beneath a swol- year's winners of the PC Magazine len sea of marketplace hype and hyperbole.

Awards for Technical Excellence.

Last year, to help sort out the winners and losers for you and to spotlight the pioneering products that can make a big difference in the way you work, we created one of the most rigorous

One evening each year the PC industry's best and brightest gather under a single roof to celebrate the spirit of inventiveness. For the second year running, PC Magazine's Awards for Technical Excellence was the hottest ticket in town.

■ TECHNICAL EXCELLENCE

seeing facilities in the country, as well as in the personal computer industry—PC Magazine Labs. Early this year, the top PC Magazine Labs. Early this year, the top PC Magazine didors and PC Labs re-searchers met to identify the products introduced in 1985 that they felt demonstrated the most significant technological leaps, And at Admain a Spring Corndex, to a hall packed with over 500 of the industriated his spirit of innovation by presenting the second annual PC Magazine Awards for Technical Excellence.

Naths for terminal accelerate.

While he previous year's swards ceremony and dinner had been held in the terminate of the state of the

Huge, life-size photographs of the cenury's leading scientists at work in their own labs decorated the walls, while a nicket of bubbling laboratory glassware gate the room atmosphere. The guestgate the room atmosphere. The guesting board of regional delicacies, and spped drinks out of chilled beakers. Later in the evening, master of ceremonies Bill Machrone presided over the actual awards ceremony, handling out the dense allver extra grant produced to the contract of the servine innovation to tubusty? a most deservine innovation.

Unlike the previous selection, this isyear's slate of winners favored creative hardware design. Last year, five out of six wards went to software authors (see "In Praise of Unsung Herces," PC Magazine, Volume 4 Number 16). This year, five out of eight awards were for inventive hardware products. In addition, we conferred a now-traditional special award for industry service.

Noteworthy this year was our recognition of the contribution made in one specific area by two industry giants, IBM and Apple. IBM demonstrated that it deserves its reputation for engineering just as richly as its reputation for marketing. And Apple, which had never before introduced a product for the DOS environment, showed that it too is capable of dazzling design work. However, we also singled out for distinction a wide range of far smaller companies whose contributions were equally worthy.

Selection of the winning products and the individual innovators responsible for these products began right after the first of the year, when we mailed out a brochure soliciting nominations from the industry. Every time PC Magazine editors hit the road to address a corporate user group, pay

 Apple Computer, which had never before

introduced a product for the DOS environment, demonstrated that it is capable of dazzling design work.

a visit to a product development department, or attend a technical forum, we reminded people that nominations were open. Likewise, we spread the word among visitors to our editorial offices and to the PC Magazine Labs.

Predictably, some companies and individuals tried to stuff the ballot boxes by nominating their own products. "That's okay," noted Bill Machrone, editor of PC Magazine. 'The number of nominations a product receives has nothing to do with our selection. And besides, sometimes you have to blow our own horn."

When the cutoff day arrived, a committee consisting of Machrone, executive editors Barry Owen and Paul Somenson, special-projects editor John Dickinson, senior cledro Bill Howard, and West Coast editor Stewart Alsop selected the eight winning products and one special award for service to the industry. Many of those nominate were certainly exciting products, but compared with the winners just didn't go far enough. Others were enhancements of familiar technologies rather than technological breakthroughs. The final selections are clearly in a class by themselves, impressive technical innovations that advance the state of the art.

PLISHABICARD Plus Development! Alrackard is to longer the only hard isk card on the market, and, in fact, managed to hold on to this distinction only bettly. Nor is it the least expensive disk on a card but when we reviewed it last fall, it was the first of its kind. The fact that there are move perhaps a dozen initutions available—a number of them impressive, and incrementally if not presentable; more thanking in movamentally in an or Postathiskingly innovamentally in our Changuzine Award for Technical Excellence.

In our review (see "The Hardcaut: A 10 Meg Marvel," Volume 4 Number 25), we described the Plus Hardcard as "a miracel of miniaturization ... a complete when the substantial s

Contributing editor Winn L. Rosch was particularly impressed by the Hardcard's installation strategy, which replaces the commonly used tag-along floppy disk full of often-arcane instructions with a ROM chip on the board. Everyday utilities are written on the hard disk itself.

In Atlanta, we recognized Plus's founder and director of technologies and strategies, Joel Harrison, an alumnus of Hewlett-Packard. Harrison, whose background is in mechanical engineering, was inspired one day in 1983 when he lifted the hood of a new product called the IBM PC-XT and realized that there were special opportunities in the expansion slots. The difficult development process involved 15 to 20 people and lasted 2 years.

Today, when it seems that every peripheral manufacturer and mail-order house has a hard disk card to call its own, the Hardcard from Plus Development Corp. is still one of the few that fits comfortably into one expansion slot (most still require a slot and a half), even in the recently introduced 20-megabyte version.

■ TECHNICAL EXCELLENCE.

APPLE LASERWRITER No one these days seems to believe much in the inevitability of a paperless society. Paper is like department-store shopping and big-screen movies: perennial as the grass. The fact is, printers and printer technology are more important than ever to productivity in the workplace.

At Comdex, PC Magazine cited two

annual special printer issue (Volume 5, Number 19, November 11). The Apple LeartWriter, however, was the first PC-compatible printer to implement the Post-cript Page Description Language from Adobe Systems (see Volume 4 Number 19, page 177). Understanding Postscript's significance is essential to understanding why the Laser area. Writer won a PC

most office environments. In addition, to get the skicker output of an off-site Merganthaler, Compugnaphic, or other dedicated typesetter, LaserWriter users can deliver design work directly (via disk or modem) without the expensive and timeconsuming intervention of a typesetting professional. According to PC Magazine's printer expert John Dickinson, 'This is a



Nevman, Jerry Robinson, and Clarkey Roges for the 18th Proprineer. Reed Stattevant of Graphic Communications Inc. for Freeduce, Ilm Armstrong accepting for the Apple Learn's Wire. Chiestopher Heavy of Joines Software Copy, for Neville Edward P. Hatchisa and Shyam K. Nagarali of Chips and Technologies Inc. for the EGA CHIPSE. Front row. Inft to right Rod Board, of Spotware Link Inc. for LANLink: Linda C. Lawrence of Thin Extendological accepting in the Apple Learn's New T-Vidents Into Of Upon and Technologies of the Edit CHIPSE. A Post of Chical Chipse. In the Chipse and Technologies of the Edit CHIPSE. A Post of Chical Chipse. In the Chipse and Technologies of the Edit CHIPSE. In the Chipse and Technologies of the Edit CHIPSE. In the Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Technologies of the Edit CHIPSE. A Post of Chipse and Technologies of the Technol

breakthrough printers. Surprisingly, both come from compaties better known for their computers. Apple and IBM. The Apple LaserWriter and IBM Proprinter are opposite ends of the performance spectrum. The former is an expensive, highend machine that produces near-typester-quality results. The latter is an impressive, American-made (rare in its category) breakthrough that pushes dot matrix output to a new level of performence and cost effectiveness.

Laser printers, like hard disk cards, are no longer unique; in fact, we expect to evaluate nearly a dozen of them in our third Magazine Award for Technical Excellence.

Postscript offers a powerful way to describe how a page is going to look. Many type setting manufacturers have implemented the language to make the pagecomposition process easer and more Resited from a software on the PC, the Apple the properties software on the PC, the Apple Lasef Writer offers the same powerful page-nateup capabilities (although with coted) presently. PC-based Lased Writer users can design and print documents with a sophistication never before available in fantastic technical achievement."

The original intent of the LaserWriter was to help expand the market for networked Macintoohes. In development, we have a compared to the control of the con

LaserWriter, PC Magazine cited Paterson, Bayles Holt, Gursharan Sidhu, and Alan Oppenheimer. Holt wrote the software, while Sidhu and Oppenheimer developed the network applications.

IBM PROPRINTER In a decade that has witnessed the rise of advanced technical research and highly efficient manufacturing capability abroad, IBM has maintained and enlarged its international markets. It is the Boeing of computer companies-neither infallible nor unassail-

able, but somehow, year after year, predominant.

Still, everyone knows that the printer market belongs to the Japanese. Apparently, someone at IBM didn't get the word. That someone is actually three people: Charley Rogers, John Newman, and Jerry Robinson, who received Awards for Technical Excellence for their management roles in the design, development, and production of 1BM's winning, made-in-America Proprinter. According to John Dickinson, the IBM Proprinter "is the first

and only low-cost printer to provide accessible and easy-to-use envelope- and singlesheet-feeding in the dot matrix field. What's more, the IBM design team achieved this without sacrificing speed. features, or output quality-or adding significantly to the cost of the product.

As our reviewer noted in last year's special issue on printers, "I liked IBM's new Proprinter when I first saw it and guessed it had a price tag of about \$750. But I fell in love with it when I found the price was only \$549" (see "Printers," Volume 4 Number 19, page 119). In a product category full of offshore-manufactured lookalikes, IBM's Proprinter is an impressive innovation at a reasonable price.

ber of new products introduced, 1985 was the Year of PC Graphics. When the PC was first introduced, the importance of graphics on business desktop computers was downplayed because PCs were regarded as word and number machines. Graphics were for games. Then business people discovered that charts, tables, graphs, and other presentations could be designed and produced on PCs. Smallbusiness, corporate, and professional demand began to grow for better graphics

EGA CHIPSET Measured by the num-

programs and hardware capability. The most significant technological breakthrough last year in the realm of graphics hardware was the EGA CHIPSet from Chips and Technologies, headquartered in Milpitas, California. Chips, as the company is usually called, saw opportunity where others saw closed doors.

The problem-and the opportunitywas the introduction of IBM's Enhanced Graphics Adapter (EGA) in 1984. IBM was trying to create a standard in an applications field-PC graphics-that lacked one. In fact, graphics equipment has been one of the most confusing product categories in the PC marketplace. Even sophisticated users are often baffled. By using five custom-integrated circuits on its EGA board, however, IBM effectively prevented other add-on board manufacturers from creating their own EGA-compatible products and enlarging the market-suppressing the very phenomenon that contributed to the huge success of IBM's line of personal computers in the first place.

THE NOMINEES

In addition to the nine winners, the following products received nominations for a PC Magazine Award for Technical Excellence.

ATI VI.SI CGA Array Array Technologies Inc.

Software Recording Corp.

Tallgrass Technologies Corp.

The Bernoulli Box Iomega Corp.

BetterBASIC Summit Software Technology Inc.

Dac Easy

Dac Software Inc. Datran Modem Accelerator Datran

Enable 1.1 The Software Group

Framework II Ashton-Tate

Micro Data Base Systems Inc. IBM/Microsoft NETBIOS IBM Corp., Microsoft Corp.

JLASER Tall Tree Systems

Lotus/Intel/Microsoft expanded memory specification

Lotus Development Corp., Intel Corp., Microsoft Corp.

Masterflight Kamerman Labs Mead Data Demo diskette

Mead Data Central

Microsoft OuickBASIC Microsoft Corp. Microsoft Windows

Microsoft Corp.

Mind Reader Businessoft NEC Multisync Monitor

NEC NetWare 1.02

Novell Inc. Network REVELATION

Cosmos Inc.

Turner-Hall

Paradox Ansa Software

Paragon Accounting

Pyramid Data Ltd. Westlake Data Corp.

PC's Limited AT PC's Limited

PC/T format Tallgrass Technologies Corp. Omodem

(Public domain, author: John Friel) R:base series 5000

Microrim Relay Gold VM Personal Computing Inc.

Star Micronics printers Star Micronics Inc. Tapestry

Torus Systems Xerox Model 4045 copier/printer Xerox Corp.



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from "XENIX RISING: The Ascent of Shared Information Computing from 1979 to 1999"

> SCO XENIX System V is available for IBM® PC AT®, PC XT®, ITT XTRA® XL and other compatibles, and AT&T PC 6300 Plus-now!

2003 is a specied referred of All Count Congruence v. 200 Trislational and Congruence in the Search Congruence, i.e., in a place of Search Congruence v. Congruence and All Count Congruence v. Congru

Enter Shyam K. Nagrani and Edward P. Hutchins, project engineers, and Yi-Hsien Hao, design engineer for the EGA CHIPSet at Chips and Technologies. They set out to design new chips that not only improved on the EGA's speed and performance, but did so at a cost that would allow alternative add-on board manufacturers to beat IBM's price (see cover story, this issue). To do this, they integrated the internal logic of IBM's five custom chips and 16 other components into four verylarge-scale integration (VLSI) components that provide 100 percent compatibility with the IBM EGA board. For their outstanding work they earned a PC Magazine "Best of 1985" citation (see "The Best of 1985 [and Some of the Worst]," Volume 5 Number 1) and an Award for Technical Excellence, Ironically, because of its price, size, and performance limitations, the IBM EGA board was not widely accepted as a standard; now that the innovators at Chips and Technologies have prevailed, the EGA is becoming a real stan-

FREELANCE Recognition for achievement in technical excellence is not based on popularity, although technical excellence is often rewarded in the marketplace. While the number of nominations a product received for the PC Magazine Award for Technical Excellence had no bearing on the hardware and software selected, the product that received the most nominations was also one that most deserved an

dard-cheaper if not cheap, and plentiful.

The epigram printed on the pastel-colored, postmodern cover of a Graphic Communications fine. brochure calmly asserts (under a heading that reads: "The Power of Persuasion"), "Most audiences only half-believe their ears. To really convince them, you need charts and graphs as stone and clear as your words."

Graphic Communications' Freelance (acquired by Lotts Development Corp. in June), the nomination leader, is a break-through product for filling that need. Free-lance was cited at the Technical Awards dinner for its "jiant leap forward in ease of ouse, power, and the completeness of its fort and picture libraries." The Awards committee considered its user interface "a clear advance over anything else we'd



Just in time, the reciving boy of Georgia Tech's new computer tab wast transformed for PC Magazine's 'Famous Labry All Time's part on the Spring Control in Adams, Surrounded by Mon- up photography of Jamous scientist (Hadamo Curie, Thomas Edison, Louis Pauteur, Oligidehoo Marcon), oral varientis while the Cale coast mighted with the bay-jackened PC Experimental Control of the Control of Control of the Control of the All to thomas this year's witness of the PC Magazine's Avantified Technical Excellent

seen." In addition to its presentation skills, Freelance complements Lotus's 1-2-3 by letting users quickly and easily modify 1-2-3 graphs.

Freelance's chief programmer was Reed Sturtevant, whose record of early achievement (Sturtevant is 29) was already apparent when he entered MIT at 16. Sturtevant set out to design a graphics program that would appeal to both artists and nonartists. Practically, this meant that his package had to combine sophisticated functions-artists are demanding-with reasonable accessibility, usually called 'ease of use." Many graphics products fail to do either; some are capable of doing only one or the other well, others manage both adequately. Freelance shines at both ends. Thanks to Reed Sturtevant, it achieved technical excellence.

JAVELIN Roughly 2 million people currently use 1-2-3. This superb program, which owns over 80 percent of the spreadsheet and financial analysis market, was one of those rare applications that actually created a demand for personal computers. Tens of thousands of companies and individuals bought PCs expressly to set up and manipulate numbers the 1-2-3 way.

This fact makes life very difficult for anyone thinking of introducing a new spreadsheet program. That Javelin, from Javelin Software Corp. (located in Lotus's hometown, Cambridge, Massachusetts), could attract favorable attention in so unforgiving a market is a tribute to its technical excellence.

Nearly every product offers graphical output. Jawelin is unique in using graphics for input. Draw a curve on the screen, and Jawelin will pick off the data points and fill its table with them. This capability, coupled with its ability to look at data from up to eight different views, its effective approach to self-documentation, and its overall ease of use, has earned Javelin a PC Magazine Award for Technical Excel-

In his "Best of 1985" citation, Bill Machrone described Javelin's achievement. "Javelin is a database of numeric ta-

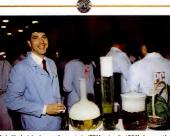


■ TECHNICAL EXCELLENCE

bles in which the relationships are defined by formulas I shat good? You but Jove-flow that good? You but Jove-flow understands statements such as profits as sales – expresses, without such excess baggage as labels, rows, columns, or mage identifiers. It doesn't even require data. You get to check your logic before entering a single cell. But Joveflir knows that you'll be entering figures in spread-sheets called sales and excenses and that if

low the standards and try to hack out market share with price and features. Telebit's 10,000 bit-per-second Trailblazer modem flies in the face of convention by using a thoroughly nonstandard technique to handle data at minimum speeds of 9,600 bps over dial-up lines. In practice, it often runs twice as fact.

The Trailblazer functions like a modem but is actually a general-purpose front-end



Cocktail beaker in hand, master of ceremonies (and PC Magazine editor) Bill Machrone considers a refill at one of the colorful, if not refreshing, labware displays positioned through the great hall.

will calculate profits from them. . . . Javelin understands time implicitly."

Three cotounders of Javelin Software Corp. received medallions. Company chairman and CEO Robert Firmin contributed his experies in business and financial modeling. Stanley Kugell, 26, is a veteral or the famed Xerox Palo Alto Research Center (PARC), which he joined at age 16. Kugell's strength in user interface August's strength in user interface contributed in the company of th

TRAILBLAZER MODEM Conventional wisdom holds that the only safe thing to do in telecommunications is fol-

communications processor for desktop computers. It continually adapts to the waying quality of a phone line by dividing the communications bandwidth into as many as 256 subcharnels and transmitting data over the most efficient ones. In the end, the Thilblazer shows that it's faster to send smaller chunks of data over the most charnels than to load all the data onto a sinter commercial product to exploit subcharnel technolosy.

The Trailblazer is an OEM (original equipment manufacturer) product, meaning that Telebit manufactures it for sale to VARs, or value added resellers, who typically add features and sell the product under their own names. This practice is almost universal in consumer

merchandising. Sears, for example, doesn't manufacture washing machines to there are plenty of washing machines out there with the Sears Keamore labeled bidge on any 10,000-tps moderns you cone across at BusinessLand, chaftees are that whatever the logo, the unit is, in fact, a Tuilbalazer (see "ASTLINK: Communicating at 10,000 bps and Up," Volume 4 Number 25).

General H.R. "Johnny" Johnson (USAF, ret.), president and founder of Telebit Corp., directed the Traitblazer devlopment effort. His development etam included Paul Baran, chairman of the board, who has 30 years of data communications experience and is credited with inventing packet-whiching technology, and Bahman Zargham, director of software engineering.

LANLINK Local area networks are the PC rage of the mid-eighties. They're impressively functional, allowing users to pass around files and share expensive devices like laser printers. They're also complex and expensive. Still, they deliver great efficiency where implemented appropriately. The nece is on, and dozens of companies are out to make bigger and better LANs.

While everybody else is designing sophisticated, espensive (in the neighborhood of \$1,000 per PC served) systems, for Rotur, realized that a whole class of user was being ignored in the process. The Group and current technical grain of Software Link, also in Atlanta, Rourk was the first to recognize that not everyone needs 100 percent of the functionality of a hardware-based network. He came up with a software Link of LoAV strategy that software Link of LoAV strategy that software much of LoAV strategy that function of the prior function of the

Roark's product, LAVLink, is known as a "zero-slot LAN" (see "Zero-Slot LAN"s A Low-Cost Solution," Volume 4 Number 24) because it doesn't require the installation of adapter boards, special cables, and complex software essential to hardware-based LANS. Instead, LAVLink fakes the PC's standard RS-22 port into running at a decidedly nonstandard 115,000 bits per second. With appropriate



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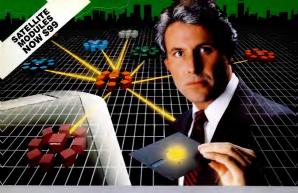
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■ TECHNICAL EXCELLENCE

drivers, multiple PCs can share files and printers over simple twisted-pair wiring, with no additional hardware. The elegantly simple solution is not the answer for all business environments, but in the heretofore unserved market for smaller, somewhat less functional, and considerably less expensive (and less buggy) local area networks, LAVLinis its the answer.

MIKE BROWN (SPECIAL AWARD) has a consistent vision: users should get the full value of the software they pay for. Unfortunately, as most readers know,

■ In our travels, we've been meeting with the visionaries, who have not been idle. Works in progress promise to be strong contenders for critical success.

Brown's vision runs counter to the sincers, but mistakenly, proclaimed interests of the many software publishers who use copy protection as a bludgeon to protect market share. While Brown has been threatened with everything but physical violence as a result of his stand, it has yet to be shown that any company has actually been hurt by cooving.

Mike Brown has not only held his own in the fierce battle of technologies that ensued, but actually gained ground as a number of major otherwise publishers saw the light and dropped copy protection. His observable of the property of the property of the server of the control of the major of

cations software.

In Alasta FC Megazine saluted Mise Brown with a special award for seving as a user-aware conscience for our industrial statistic distinction of the transport of the statisfied customers don't betray software publishers. Indeed, a senior editor Bill Howard has commented, "Locks tend to keep only the honest people out." And we acknowledge his technical achievement devining and publishing updates to disk-vining and updates and the state of the state of

NEXT YEAR'S WINNERS. We're justover halfway through 1986, but we justover halfway through 1986, but we alneady thinking about the next round of
Awards for Technical Excellence. In our
frequent travels, PC Magazine's editorial
staff has been meeting with the innovators
and visionaries, who have not been side.
Just thinking back over the past several
months, we have seen works in progress
that promise to be strong contenders for
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Because the largest of all PC trade shows—Fall Corndex in Las Vegas—occurs in November, products trend to be inused that in the year. But even what can be compared to the control of the conceived that in the year. But even what can be control of the control of the conceived that in the control of the conceived that the control of the conposition of the control of the conposition of the control of the cont

In the midst of all this creativity, the business magazines are bemoaning the moritoned state of the computer industry. Of course, IBM isn't selling as many amainfarnes. The real work is getting done on the machine in front of you. And the real creativity was long ago diversed to personal computers. Some of us dearly love big machines, but talented designers go where their work can be seen, to where it really matters. He desktop.

When we look back on 1986 from the perspective of the Awards for Technical Excellence in 1987, we predict that this will have been a watershed year. The progress that innovators are making in power, price, and performance will set new standards for personal computing.

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XENIX SYSTEM V A MULTIUSER ANSWER FOR THE AT?

SCO has ported the current version of AT&T'S UNIX to personal computing. On 80286-based machines, its multitasking and multiuser features are finally practical for a number of amplications.

After more than a decade of chaos and competing standards, AT&T finally standardized its venerable UNIX operating system in January 1983, with System V. Santa Cruz Operation's recurrelease of Konix System V means that the current version of the multitasking, multiuser system is now available for the PC family, and that's good news for business computing.

Xenix System V is large and multicected. Its myrist features include a beauting system with four shells, a dial-up and direct network, and a full-screen oditor. The program development component contains Microsoft's new omer ge compiler. The text-processing system contains the touled in 70f document formatter, and programs to generate tubles and math symtolic formation of the contained of the system of the contained of the contained of the particularly well suited to the business environment, such as file-locking.

Although Xenix System V is most re-

sponsive in the hands of an experienced programmer, it can, thanks to careful documentation and some comfortable user interfaces, be tackled by nonprogrammers.

Xenis, the most widely adapted version of UNIX, is presently installed on more than 85 percent of all microcomputers running UNIX and on more than 50 percent of units of the present of t

For programmers, the primary reason for choosing System V over other versions of UNIX is largely a matter of standardization. AT&T developed the System V Interface Definition (SVID), which specifies the hardware-independent interface between application and operating system. Xenix System V application developers

who adhere to SVID functionality requirements can ensure that their applications will run on any System V architecture, not just Xenix. This standardization makes programs and applications portable to a wide class of machines, from PCs to minis to huge supercomputers.

In addition to supporting the wellknown and powerful set of standard UNIX tools, SCO's Xenix System V creates a dynama or the standard to the standard to the control to DOS programs. With Xenix you can develop, compile, and link C programs for MS-DOS environments. Complete DOS libraries are integral to Xenix. Xenix can also copy files to and from a DOS hard disk partition or floppy. Xenix's multituser capabilities give program developers the

ferent parts of the same project.

Users who want to run applications in Xmix also reap some benefits from System V. It is the first UNIX system to standard set of tools for file-locking and saturd memory. It is also more easily assumized for installation than its predocesors; you can choose the parts of the system that you wish to install and those you can easily invisible to grow the parts of the system that you wish to install and those you can uninstall any part of the system at any time usine a memu.

opportunity to work concurrently on dif-

Ustran Xenix users will appreciate the PC-environment improvements. For example, SCO Xenix System V can detect the 8087 or 80287 math coprocessor chip and take advantage of it if it is present.

Two basic groups of users are attracted to Xenix: the first is composed of UNIX users who want to use Xenix because of the low-cost machines it runs on. The other comprises DOS users who need Xenix's multitasking and multiuser capabilities. If you think of DOS as a one-person kayak, then Santa Cruz Operation's Axinix is a cross between a Polynesian war canoe and a one-man band.

A DUAL EVOLUTION Two years ago, when Xenis System III (derived from UNIX Version 7) was released for the PC-XT (see "A UNIX to Be Proud Of," by Karae Christian, PC Magazine, Volume 3 Number 10), the system software had promise, but its performance was barely adequate. Many programs took too long to start executing, and the system bogged

down seriously whenever two people used it simultaneously. Xenix System V is markedly cleaner than previous versions.

Technically, the old Xenix was a multiuser system, but the 4.77-MHz PC and its almost-as-slow-as-a-floppy hard disk were too sluggish to support more than one user. That system was a useful UNIX environment, but it didn't bring true multiuser performance to personal computing.

 If DOS is a one-man kayak, then SCO's Xenix is a cross between a Polynesian war canoe and

a one-man band.

Both the hardware and the software have evolved over the past 2 years. Xenix Nystem Y is a different vector 2 was a consistent of the property of the PC line to withstand a medium reaction of the PC line to withstand a medium reaction of the PC line to withstand a medium reaction with the PC line to withstand two particles with the PC line to withstand two particles with the PC line to withstand two particles with the PC line to withstand two particles. ATT is vivice as fast and twice as large as the original XT hard disk. BIM and others have announced ATT as machines that run considerably faster than the original 6-MHz AT clocks speech.

How many users can a multisurer system support? That depends on what the ers are cloing. If none of the users are very memory or disk-time intensive, then Xenix on the AT might support the 16 terminals that you can book up to the system. A more radistion number is in the neighborhood of five. And if you want to support programmers who feed on a massive dist of CPU cycles, you shouldn't put more than two on a sinste AT.

BASE SYSTEM FEATURES The Xenix base system comprises over 200 utility programs; the handful of examples discussed below indicate the features that give Xenix its reputation for power and flexibility. Some, such as the utucp utility, are UNIX standards; others, such as Multiscreen, are available only for the PC.

Xenix's Multiscreen feature is a boon for those who like to do several things at once. A single keystroke switches the console screen and keyboard from one log-in session to another. It's as if you have several terminals on your desk, but with only one physical screen and keyboard. The applications for this feature quickly become evident. For example, when preparing a table of figures, I used the editor on one screen and a desk calculator program on another, and I previewed the printer output on a third. Switching from one to another was trivial: Alt-F1 pulled up the editor screen. Alt-F2 brought forth the calculator, and Alt-F3 showed me the printer preview. Each screen switch takes just a fraction of a second.

Xenix's Multiscreen solves several problems with most DOS RAM-resident utilities. You don't need to permanently set aside memory for a function you may



Xenix System V
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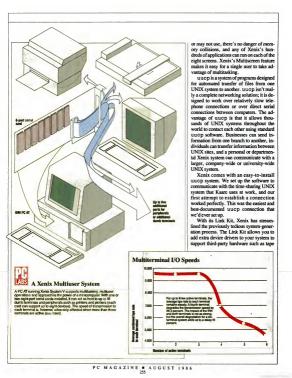
List Price: Operating system, \$495; program development system, \$495; text-processing system, \$195; complete SCO Xenix system, \$1,085. (Upgrades to System V from either IBM Xenix System III or SCO Xenix System III on swildblab.

System III are available.) Requires: 384K RAM (at least 512K RAM for the development system), one double-sided disk drive, 10-megabyte or more hard disk drive (20 megabytes is recommended if you plan to use the entire system. Minimal runtime system requires 1.8 megabytes of storage, complete base system requires 4.5 megabytes, program development system requires 3.7 megabytes, and text-processing system requires 1.5 megabytes). In Short: A multitasking, multiuser version of UNIX System V, the AT&T standard for UNIX systems. Contains a complete set of features and utilities for programmers who want to develop software and for users who want to run applications. Some features, such as file-locking and shared memory, make it

particularly well suited for business environ-

ments. Not copy protected but requires an authorization number to load.

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■ XENIX SYSTEM V

backup units. Because the Link Kit is incorporated into the base system, you are spared from having to buy the whole Xenix program development system to rebuild the Xenix kernel. You don't have to use the Link Kit to support several quad and octal (four and eight port) serial boards because Xenix already supports up to four. Similarly, you don't need the Link Kit to configure printers.

BRIDGING TWO WORLDS Xenix can share a fixed disk with DOS. After the disk is formatted, it must be partitioned with FDISK. Usually you must run FDISK twice: you run the DOS version to set up the DOS partition and then the Xenix FDISK clone to set up the Xenix partition. The machine will boot the active partition.

FDISK can also change the active partition. For example, if you have been using Xenix and want to run DOS, before you shut down Xenix you would run FDISK and make DOS the active partition. Then you'd shut down Xenix normally, and when you rebooted, DOS would take over, An alternative is to use a floppy to boot to DOS and keep the active fixed-disk partition set to Xenix.

Although Xenix doesn't allow you to run a DOS application directly, it does allow you to access DOS files that are located on a floppy disk or on a DOS partition of your hard disk. The major components

of the DOS access system are dosdir, which lists the files in a DOS directory; dosca, which copies files back and forth: and dosrm, which deletes DOS files. Xenix supports 8- and 9-sector 360K floppies and 1.2-megabyte floppies.

THE SHELL GAME A UNIX shell is its user interface. Most versions of UNIX come with multiple shells, and you can pick the one that best suits your style and level of technical knowledge. After you log in, the shell of your choice interprets your commands. Xenix comes with four powerful shells: the regular Bourne shell (which is the default), an old standard familiar to UNIX users that many find cryptic and intimidating; the enhanced System V Bourne shell, which has a few extra features for writing shell scripts; the Berkeley csh (or C shell), which many people prefer for interactive use because it has a history mechanism that lets you reenter previous commands with a minimum of keystrokes; and a visual shell, which is a UNIX menu system that allows you to choose from menus of options and which is especially good for setting up an applica-

The variety of shell offerings is another mark of Xenix's flexibility. Using the shells for entering commands and creating scripts lets you work with multiple Xenix tools to create ad-hoc applications.

PROGRAM DEVELOPMENT In the beginning, the UNIX system was conceived by a few gifted programmers to meet their own needs. This latest version of Xenix doesn't abandon its roots; rather, it returns to them. Programmers benefit from Xenix's rich array of tools and the fine-tuning of many of the older tools.

The single most important Xenix System V enhancement is the C compiler. Most UNIXes are equipped with a version of the famed Portable C Compiler, While it is portable, the Portable C Compiler has never been strong on performance. Xenix is equipped with Microsoft's acclaimed cmerge compiler. Most reviews of ome rige have noted its range of features and impressive performance.

Xenix System V's cmerge C compiler can produce programs executable under DOS or under Xenix. Xenix executables

A XENIX GLOSSARY

adh: A general debugging command.

awk: A simple programming language that scans files for specified patterns. Berkeley enhancements: A set of

UNIX utilities developed at the University of California at Berkeley.

Bourne shell: A shell, or user interface. that is a UNIX standard.

csh (C shell): A shell whose style is reminiscent of the C programming language part of the Berkeley enhancements

custom: A Xenix utility that allows you to selectively install or uninstall the major Xenix subsystems.

dbx: A high-level debugger found on Berkeley systems.

/dev: A directory that lists special device

eqn: A mathematics typesetting program.

kernel: The heart of a UNIX system. The shells and utilities request services from the kernel, which can talk to I/O devices, run programs, and manage

memory. ld: The lineage editor, similar to DOS's

LINK command. lex: A lexical analysis generator. Often used with yacc to develop program-

ming languages. lint: A C-program analyzer.

make: A program that automates the compilation of program source files.

man: A command that displays manual

pages on the screen. mkdev: A command that initializes a hard disk.

mkuser: A command that adds a user account to the system. mm & ms: Macros used to control text

formatting. nroff: A text-formatting utility for stan-

dard printers. pic: A utility that typesets line drawings.

refer: A utility that manages references for text processing. SCCS: UNIX Source Code Control Sys-

tem, utilities for large-scale software development. sdb: A high-level debugger used on Sys-

tem V. shell: A program that causes other programs to be executed on command.

For example, UNIX shells perform the very same task as DOS's COM-MAND.COM.

tbl: A utility that formats tables. troff: A text-formatting utility for type-

setters or laser printers. uucp: A utility that copies files to and

from a remote system. vi: A visual text editor, part of the Berkeley enhancements.

vacc: "Yet another compiler-compiler." A utility that converts contextfree grammar into tables for parsing algorithms.

A remarkable breakthrough for LANs-one that's easy to use: Tapestry With this coupon you get a

matter what local area work hardware you chooseur next choice should be Tapestry network operating software from Torus Systems. Here are 6 reasons why.

IBM chase Tapestry, for its overseas market, and it quickly became the hottest LAN system in Europe.



This is the friendly screen that caught Big Blue's eve.

1's the warld's easiest-to-use netwarking software – much simpler than Novell, 3Com, ar IBM because Tapestry is monoged with icons. To use it, you just point to grophic symbols: the "in-tray" to get moil, the "cabinet" ta occess files, and so an.

You even use icons to configure the system, so almost onyone con set up a Topestry network-and keep it running smoothly

3 Tapestry is the most camplete LAN software money can buy. The basic system gives you: Advanced electronic mail Compose memos with the Tarus text editor. Send them to any person or group on the network, just by pointing ta names. Trock the mail you've sent.

Get messages instantly

 Cost-effective sharing of hard disks, printers and modems You can have up to 100 Tapestry warkstation/servers and occess ony ane of them by touching the right ican. Since all Topestry servers are undedicated, each station is free for business as usual. You don't have to invest in specialized hordwore, or sacrifice your valuable PCs.

Advanced communications capabilities

Need information from the company mainframe or on autside service? Just point to the desired Service icon. Torus offers a family of network goteways* that automatically make the connection and speed your information through. · And there's more!

Tapestry also provides central starage of all your applications so they too can be accessed with icans. Automatic file locking so you can safely run singleuser opplications not originally designed for networks. File Monager icons that let you monipulate files without using DOS commands. And a Telephone Monoger that places your calls and maintains a personal electranic raladex



What good is a network if your people don't know how to use it? Tapestry's screens are so easy to understand, onyone can net great results without special skills or training.

Tapestry supports all the standards, like IBM Taken-Rina. PC Network and 3Cam hardware. Like PC-DOS 3.1 and NETBIOS. So you can choose the LAN hardware that's best for you, and you won't hove to warry if your software will run."*

5 Tapestry is proven and reliable.
Thousands of Tapestry stotions have been installed in both large and small companies in the U.S. and around the world. Custamers include: Proctar & Gamble, EDS, the White House, the IRS, Prime Computer, TRW, NBC News, Shell Oil, Exxan and Citicarp.

FREE Network Manager AND a money back guarantee! Usually, Tapestry costs \$495 for your first workstation (the Network Monager) and \$295 for each additional station; BUT NOW YOU CAN GET A TAPESTRY STARTER PACK (BOTH THE MANAGER AND THE SECOND STATION) FOR ONLY \$295!

And we're so confident you'll love Topestry, we'll let you return it-for any reason-within 30 days of shipment and we'll aladly refund your purchase price (less \$50.00 restocking fee).

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SMAX. ICMS hard-date Station 2 ISM PC.XT.AT or compositor 320K Plus suitable networking hardware Notes "ACRIC is standard while VTIOD 3270 SNA and Remote Access are purchased separately "Tested applications include diase II Plus, MultiMate Advantage, Open Systems Acco Deploywite 3, WordPerfect, MS Word, Letus 1-2-3, AutoCAD rd Station Pack - \$1495, 24 Station Pack - \$369

tat hydernates 30om - 30om Corp. BM Displayerie 3 and PC-DOS-IBM Core: MS Word - Microsoft, Inc. dBase II Plus -Agency-Total 1-2-3 and Latus - Latus Development Corp. WordPartiet -- Sqraffin Software International, AutoCAD-Autorities Inc MuthAlore Advantage - MultiMote Interrollore Novel - Novel Inc. Open Systems Accounting - Open Systems Inc. di 1996 Tyrus Settems 495 Second Court Redwood/Chr. CA (415):353-2416

OFF-THE-SHELF SOFTWARE FOR XENIX

More commercial applications than you might think are available for Xenix, including a sophisticated word processor and a 1-2-3 workalike.

And more are in the pineline.

DOS users are often bermused by the DuK deep dipolations software for the UNIX environment. It's as if UNIX programmens take a special pleasure in rein-venting the wheel each time they need to perform a state. Only a handful of applications programs are currently available for Xena. System if Yom SCO, but the prognosis looks good. Xenix users with whom we speck are optimistic that within in a year or two the number of good applications of the prognosis looks good. Xenix users with whom we speck are optimistic that within in a year or two the number of good applications. The prognosis of the pro

The SCO's Lyrk Word Processing System (595); mos on the IBM PCA AI, ATER 6300 Phus, and IBM PC And XT) is a comprehensive and fully configurable word processor. If you come from a UMIX background, you'll find Lyrk and ideal system, combining a handstone and intuitive user interface with powerful facures. If you come from a DOS background, however, you may find the lack of contex-sensitive help and dynamic menus an incredible hindrance. Comments an incredible hindrance. Comtractive is about at aintuitive as an animal born in candivity.

Lyrá does have intenctive spelling and hybeatonis, support for all terminals, and an easy-to-use interface to U-NIX/ensit sutilises such as electronic mail. In the multitasking, multiuser tradicion of most UNIXes, everything about typers can be customized, including all commands and messages, special characters and frequip in languages, function access and foreign languages, function of the control of the co

According to SCO, SCO Professional

■ DOS users are often bemused by UNIX programmers, who seem to take pleasure in reinventing the wheel each time they need to perform a task.

contains even more query fields than 1-2-3, a larger worksheet, full-preview character-graphics support for any standard terminal, and a sparse matrix-memory manager for optimal spreadsheet storage. File-locking protocol is used to prohibit multiuser conflicts. SCO's FoxBASE (\$795; for the IBM

PC AT and AT&T 6300 Plus) is SCO's dBASE II workalike, although beta testers (it was also not ready for review) tell

us it has all the features of dBASE III as well. It is both language- and file-compatible with DOS's dBASE II, including full macro usage. Testers tell us it is quick and has twice as many memory variables as dBASE II. Because it is written in C, it is extremely portable, thereby maximizing program development efforts. FoxBASE can run dBASE II programs in multiuser mode without any modification. FoxBASE compiles program source code into object code in a compact form. It uses virtual storage to increase speed, and it uses a B+ tree algorithm to maintain indexes that require less space in memory.

System (\$5995; IBM PC AT, AT&T \$600, PC and XT) contains its own interactive date cuty and maintenance program. It also includes the Dostatus database monitor (including and and renevery trails), a data-description language compiler for creating and modifying the database, the Ace report-writing language; the Perform data entry and acreen-oriented transaction processor, and a language IIthe database. Higher used Xeath's falllocking protocol. For large systems development. Higher is highly respected.

The Informix Relational Database

Other Xenix applications include Multiplan Exteronic Spreadsheet (5495). CJSAM (5325). Compact Level (1998). CJSAM (5325). COMpact Level ICOBOL (1999). COBOL Run-Time System (5 195). Microsoft BASIC (5395). Microsoft PORTRAN (5305). Microsoft Poxel (5495). Microsoft Poxel (5495). Microsoft Poxel (5495). Microsoft Poxel (5495). SCO UnitPATI (5495). Microsoft Poxel (5495). Microsoft Poxel

-Robin Raskin and Kaare Christian



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YOU COULD PRINT EVERYTHING ON THIS DESK FROM A BUSINESS PC?

The world's best-selling desktop laser printer has something in store for just about every business that's

ever dealt with the printed word.

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omfessional-looking output.

Combined with our very fast, very versatile HP Vectra PC (it's IBM PC/AT compatible) and the software of your choice, the HP LaserJet is the cornerstone for a complete desktop publishing solution. One your whole company can easily use.

Of course, the HP LaserJet also works with IBM PC's and compatibles works with IBM PC's and compatibles. As well as software like Lotus 1-2-3, WordStar and d:BASE II. And, for around \$3,000, it's the laser printer you can afford.

We can't print all the reasons our We were X HP LaserJet is the printer of choice. But if you stop by an authorized HP dealer or call us at 1 800 367-4772, Dept. 709F for the one nearest you, we'll show you why HP quality printing makes very good business some include.

Prof. samples produced on a Lorenza files with the following software processing. Study Software Software 1 Develop Register Natural Prof. prof.





can be produced for System V or for Xenix III. Several styles of floating-point calculation and four memory models are supported, and the compiler can generate code for the 8086 as well as enhanced code that utilizes the extra instructions of the 80186 or the 80286. That's a host of features not found elsewhere.

Other major ingredients of the program development system are make, scos, yaco, lex, and lint. The system includes the standard profiler for tuning your software, two programs for generating cross-reference listings, and a program to produce program-flow graphs. Unlike the Portable C Compiler, omerge can pro-

duce C program listings.

cne Tg e is underiably a beaut, but
several ingredients are missing. SCO has
included the, her primitive machine-level
debugger, but omitted both of the more
openerful, higher-level UNIX debuggers,
System Vis acid and berchedy's dbx. In
comments, it is possible to spice as few lines
of assembly language into a C program,
and it is possible to optica after lansemble
the assembly language output of the C
compiler. Both of these oft-used capabil-

ties are missing from one rge.

But the worst omission concerns the
DOS development environment. The
munual contains a li-nich-thick description
munual contains a li-nich-thick description
copately discuss the DOS subroutines. It
includes a list of the common subroutines, an
includes a list of the common subroutines, and
subroutines, and as list of the DOS-specific
subroutines, but the DOS-specific routines
aren't described anywhere. You only option. If you want to do DOS development
in X xenic environment, is to buy the DOS
specific routines.

FORTRAN is a part of most UNIX systems, but SCO charges \$495 extra for it. Berkeley UNIX systems include Pascal and LISP, but LISP isn't commercially available for Xenix, and Pascal costs \$495 extra. (Xenix FORTRAN and Pascal are available only on the AT.) Microsoft CO-BOL is also available for Xenix.

TEXT PROCESSING When UNIX was developed at Bell Labs, its first application was in the Bell Labs Patent Office. Perhaps this explains UNIX's unprecedented

attention to text processing.

UNIX and Xenix text processing is fullfleatured—but with a definite progressing system's features include processing system's features include an of If for formating documents on standard printers, it of If to generating types ect output, 1b1 for managing equations. Two other handy programs—re I'er, for managing references, and p1c, for typesetting line drawing—are not supplies—are

• One of the major applications for Xenix machines is to run just text-editing programs.

The supplied version of troff is the original, not the newer (and much better) terminal-independent troff. Kenix, like AT&T System V, has settled on the mornatting macros. Unlike a true System V, it also supplies the popular ms macros, although they are not even mentioned in the documentation and are presumably aspopted. (The v1 text defice is supplied

with the base system.)
One surprising member of the textprocessing team is man, the UNIX program that displays manual pages on the
screen. However, even though man isself
is present, none of the manual pages supplied on disk, so there is nothing for
man to display on the screen. SCO is
aware of the lack, but because the missing
pages require a lot of disk space, it has no
immediate plans to supply them.

UNIX's word processing programs are extremely powerful, but they lack the ease of use that most PC users take for granted, such as context-sensitive help, dynamic menus, and bit-mapped graphics. The UNIX text-processing tools have proven themselves over years of service producing technical documents, but there are thousands of better systems for writing a.

One of the major applications for Xenix machines is to run just text-editing prograins. Many academic and industrial research groups have enormous investments in these tools. A multiuser Xenix system is one of the most cost-effective ways to produce technical manuscripts, especially if you have already learned the system.

You can have the best text-processing tools in the world, but if producing hard copy is a nuisance, you're in trouble. This is the sad but true slory of Xenix printer manufactured in the stat decade, you had better get out the manual and look up its control codes. Even worse, you need to purchase the software development system if you want to add custom printer support to Xenix.

Everyday printers such as the Epson MX-80 or the Okidata 92 are considered special cases that SCO doesn's support. SCO does support the DASI 300 and 450, the HP 2531, the Teletype Model 37, and the GB Terminer 300. Are any of these even manufactured anymore? A similar list of supported printers is found in my 1974 Version CRNX, manual. Printers are considered to the CRNX of t

In the minicomputer wordt, the UNIXsystem has nicely adapted to the energence of powerful laser printers. Virtually every laser printer ever made is supported under UNIX, making it easy to produce near-typested quality economically. However, when we asked the SCO support pole how to get laser printer support for Xenix, their response made us wonder if they had ever used a laser printer. They then restated their claim that SCO supports all printers using a parallel or serial port.

SYSTEM ADMINISTRATION Xenix is more difficult to manage than DOS, but the words you for your extra work with it rewards you for your extra work with unany additional criticisms of UNIX is that running it is more like leading a cult than managing a computer. If you travel in the right circles, UNIX system-administration knowledge is available, but if you're outside the children of the property of

Xenix System V rectifies many of the traditional UNIX system-administration headaches. For instance, adding accounts

SYSTEM V: A XENIX FOR BUSINESS

System V has made Xenix and UNIX more practical for business, as these case histories of corporate users show.

If the word UNX makes you think of a university computer center full of hackers, it's time to change your thinking. With their System V releases, both UNIX and Xenix are moving into the business world in a big way. Here are just a few of the companies that have incorporated Xenix into their day-to-day operactions.

XENIX SIZZLES "We looked at a variety of operating systems, and in the final analysis I'd have to say it's the rich set of tools available for Xenix and its reemblance to MS-DOS that made the choice for us," says Richard Kimsey, system manager for Sizzler/Minute-Lube Corn.

The Salt Lake City-based corporate headquarters of Sizzler/Minus-Lube franchises is a longtime user of Xenix; in time, the entire chain of 36 Sizzler restaurants in four states may migrate from DOS to Xenix. Currently the restaurants run dBASE II software on the AT&T 6000. To accommodate the wintch, Sizzler is beta-testing FoxRASE, SCO'S dBASE II worklike, and so far the company is enjoying 100 percent success in porting its files to the Xenix environ-

ment. Kinsey and the staff developed a Kenix-based restaurant manager program to hander procedures including data entry for payroll, cash receipts, sales, and inventory control. The group's lastes activity involves implementing an eletronic filer transfer to the main sites. "With DOS you need some program maning ally yield a right with surges," which the program of the program and the program of the program and the program of the program up modem. A better choice for us is usupe, based *kanis, usups; sepecially sales to set up and vary full featured."

At Sizzler headquarters, two AT&T 6300 Pluses run SCO System V. These two- and three-user systems use the Comol Systems Hosters Card to support to the Common Common Common Common Systems Hoster Common William Co

DESIGNING PERIPHERALS Computone Systems of Atlanta uses SCO's Xenix System V for its operations and also markets unique and imaginative hardware peripherals and software for the Xenix market. Computone's most opular product, the ATvantage-X, is a Xenix multiport expansion card that links eight scrial ports (up to 16 users) for tereight scrial ports (up to 16 users) for ter-

minals, printers, and other devices to a

PC AT.

Other Computone products include Xenix software drivers, a 60-megabyte streaming tape backup unit, a maileable RAMdisk product, and The Office AT-younge, an office utility software package that includes an appointment scheduler, calendar, electronic Rolodex, memo writer, and other office-management tooks.

The Xenix group at Computone relies on The Office ATvantage to manage its day-to-day activities, and group members do a considerable amount of mesage passing. The typical in-house configuration supports seven or eight users per system with an AT host.

Computone's Xenix products are developed almost exclusively on Xenix machines. The Office ATwartage software, drivers for the hardware products, and all on-board firmware were developed using IBM's System III and SCO's Xenix System V. The programming team uses vi., SCO's Informix SQL database manager, Lyrix, and both C and assembly language programming for Xenix software development and internal documentation.

Computone still relies on DOS for hardware development, and the company uses DOS-based CAD packages, although the Xenix group is interested in exploring the PC-RT's potential as a CAD system machine.

TRACKING THE FLEET. "We see Xenix as a good choice for micro-based multitasking, multituser applications of velopoment." says Larry Askew of GTE Corp. GTE Data Services, a wholly Xenix to develop FleeTracker, its vertical-market fleet management program. The system does inventory maintenance, operating-cost management, performance analysis, and maintenance trackment of the programment of th

for each vehicle.
Running on a PC AT, FleeTracker is a low-cost, multiuser system that generally supports four terminals. In a typical configuration, each garage supervisor or parts person might have a terminal running the system.

Based on Informix SQL, FleeTracker takes advantage of Informix's excellent query capabilities. GTE developed additional database reports using C. The system's multiuser and multitasking capabilities are put to work when users simultaneously enter data, generate reports, and query the database.

(The FleeTracker system is available connectially from GTE Data Services, P.O. Box 1548, Tampa, FL 33601 (800) 237-4243; in Florida (800) 282-6940.)

—Robin Raskin and Kaare Christian

No one's ever had But then no one's ever

66We typed In at a prompt: 'Who works in administration?' 'List the total salaries for the sales department? **0&A** handled these questions without further prompting. ??

"O&A" comprises menu-driven. integrated word processing and database functions...and adds to that a smart query language that gets even smarter as time passes. That's pretty special."

"At the heart of the O&A system is the Intelligent Assistant* Q&A is delivered with a 400-word vocabulary and a utility that enables you to 'teach' the Intelligent Assistant all about a given database."

"Once you describe your database to the Intelligent Assistant, it's ready to go to work for you."

First, O&A parses a request and attempts to understand it based on its own vocabulary and its past experience. If it can't understand a word or phrase, it asks for more information from you until both system and you agree that the intent is clear. After it delivers the requested report, it remembers the discussion so that the next time similar phrasing and vocabulary are used, it will not have to ask for clarification."

"Is O&A smart enough to stand in for the microsystems specialist on the weekends? Can the untrained boss actually sit down and have a meaningful discussion with his database management software? Our experiments certainly support that view."

"For the 80% of data management tasks that can survive in the world of flat files, Q&A seems to provide a uniquely functional answer. Its designers have done well."

-Richard Aarons PC Magazine, March 19, 1986

66Blends Software Publishing's ease-of-use methodology with features more common to heavyweight data managers, 99

"Intended for those who want ease of use without sacrificing versatility, O&A has the look and feel of

the pfs: products but is easier to use." "pfs: veterans can be up and running in short order with Q&A's single-file data manager. Further examination, however, reveals flexibility more akin to data management heavyweights dBASE III or R:base 5000?

"O&A...benefits greatly from a natural language interface. That interface, called the Intelligent Assistant, is an artificial intelligencebased front end that enables you to issue commands to the data manager

in plain English phrases."

"The Assistant's real strength is the ease with which it lets you ask complex questions like Show the electrical engineers with a salary between the average and maximum. The Assistant will gather data on the salaries of all the electrical engineers in the database, figure the average and the maximum, and report the results. You get three separate functions from one query and you don't need to program the database for the mathematical calculations"

"Symantec also had the foresight to include a host of conveniences usually found only in more ambitious programs: a keyboard macro facility for storing and recalling frequently typed commands or phrases, plus utilities for importing and exporting data and copying, renaming, and deleting files."

-Jim Heid PC World, April, 1986









processor, file manager, and report generator to form a productive, even fun. business application tool, its Intelligent Assistant feature uses artificial Intelligence technology to dramatically reduce the learning overhead. Useful. reasonably priced, well-made, not copyprotected, Q&A is recommended."

"Q&A smoothly integrates a word

"The word processor and data manager are Q&A's two primary modules. Each of these applications is sufficiently powerful to compete by itself with popular word processors and data managers"

"Although O&A's word processor is a stand-alone application, it is also an integral part of the data manager Moving from one to the other is only a matter of a few keystrokes. One of the slickest features of

the word processor is the print envelope command, if you type a letter, you do not have to type the address a second time in another file to print the address on an envelope. Q&A reads the letter, finds the address, then spaces the address properly for a business-size envelope."

"Form generation is a breeze... You can draw boxes, center lines and set tabs...And you can create custom help screens for every field, which can be important in an environment where several people may be using a database."

> -Keith Thompson InfoWorld, January 13, 1986

reviews like these. had a database like this.

66Q&A seems to me the quintessential manager's product.??

"A near perfect tool for people who want to use their PCs to poke around in customer lists, personnel lists, product lists, and who also need to write reports and letters, all in the interest of doing their jobs better and more easily.

"In fact, couple Q&A with a power spreadsheet like 1-2-3," and a sophisticated organizer and to-dolist keeper like TinkTank or Ready!, and you've got very nearly the ideal manager's software kit."

"An essential element of a good manager's software is that the person who's going to use it doesn't need to know much about it."

"Say I'm a broker in a securities firm. I want to have access to lists of my customers, salespeople, current buy-sell recommendations. I'll want customers' buying histories and performance figures for the salespeople. And that information needs to be updated frequently, possibly daily.

"But what I don't want to do is spend a few days setting up those databases.

"What I want is to slt down at the computer for a few minutes, set up some input screens, then hand the inputting job to an assistant.

"Managers of the world, I give you Q&A."

"When you reach into Q&A's 'Intelligent Assistant' you see why Q&A's such a hot tool for managers. 'The Intelligent Assistant

query mode lets you use some very sloppy phraseology to get back very useful information. You'll need to define your more casual terms once, but thereafter, specifying search criteria is ridiculously easy."

-Jim Seymour PC Week, January 21, 1986

66Q&A's database and word processor add features without giving up ease-of-use 99

"Q&A includes among its many attractions not only the file manager and a report generator to extract information from those files and print it out as desired, but a quite useful word processor inte-

grated into the package as well.

"The word processing segment of the software can, in fact, be
used by itself...All of these features take the what you see on the
screen is what you get on paper"

form."

"Information from Q&A files can easily be merged into documents produced by the word processing segment of the program. Consider, for instance, the ubiquitous form letter. All that is meeded to generate the individually addressed copies of such a letter is either side of the field name corresponding to an entry in the database.

"For example, entering 'Dear 'title' *last name*' at the beginning of the letter would result in the automatic salutations 'Dear Miss Willard', 'Dear Mr. Lewis', and so on throughout the whole gamut of individuals chosen to receive the letter."

- Erik Sandberg-Diment The New York Times, March 9, 1986

66Highest comparative rating ever. 99

"QBA, the new file management and word processing program has earned the highest comparative rating ever awarded by Software Digest."

"Q8A's superior user interface and extraordinary number of features rockeled the program to its recordbreaking score, proving that a program can be both easy and powerful!" "Manual is easy to under-

stand, well organized, with excellent examples." "Excellent explanation of program

commands and functions."

"Easy to enter/modify data in a record."

"Easy to change an existing file's

record structure."

"Easy to search for a record using single criterion or multiple criteria."

"Easy to merge databases."

—Software Digest, February, 1986

*O&A is a database integrated with a report

generator, word processor and spelling checker. Its natural language interface, the Intelligent Assistant, lets you run the dalabase by typing in instructions and requests in real English sentences. Q&A runs on all IBM PCs and competibles with 512K or more of RAM and dual floppies or a hard disk.

For complete product information and the dealer nearest you, call 1-800-441-7234. (In CA 1-800-626-8847).



for new UNIX users has traditionally been a manual, error-prone process. Xenix includes a program called mixus er that effectively adds or removes a user account, not a considerable and the control of the control of

Xenix's best system-administration enhancement is the outs for utility, a program that allows you to selectively install or uninstall the major Xenix subsystems. For example, if you don't want the games that come with Xenix System V on-line, simply run outs ton, select the games subsystem from a menu, and ask out of ton to uninstall them. You can save disk space

by tailoring the system to meet your needs. One system-administration area with which we had some difficulty was configuring Xenis, for a second hard disk drive. A convenient program called mkde'v lest our initiatize a second hard disk; it partitions the disk, scans if to the discess hand to the contract of the

ing the files in the /dev directory. Another system-administration trap lies in wait for the unseasoned user configuring Xenix to work with additional terminals. A system configuration file called /etc/ttytype details the type of terminal attached to each serial port on the machine. But there are two sets of names for Xenix serial ports, one set to maintain compatibility with previous versions of Xenix and one to reflect the capabilities of the new system. The old names are in the /etc/ttytype file, but the standard utilities only work if the file is changed to reflect the new names. This sort of troubleshooting is a snap for a UNIX veteran, but a first-time user will be on the phone to SCO immediately.

Despite these miscellaneous shortcomings, Xenix System V is an easy system to administer. The most common procedures are well documented in the 100-page Operations Guide, and extra utilities have been added to the UNIX repertoire that ease system administration.

DOCUMENTS AND SUPPORT Xenix's documentation is 3,000 pages long and 24 inches thick. It is a document in which the section describing the document itself is 70 pages long.

 Despite miscellaneous shortcomings, Xenix

System V is an easy system to administer.

Xenix's 3,000 pages were, like Rome, not built in a day. Some of those pages were first written for UNIX, 10 years ago, before SCO or Xenix were even a gleam in a capitalist's eye. Other pages are so fresh they contain those egregious typos and obvious blunders you associate with documents on which the ink wasn't dry when the shrink-wran was anolied.

Overall, SCO has made an admirable attempt to supplement the notoriously programmer-level UNIX documentation with user-level manush that describe the major subsystems. Some of these user-level guides are standard documents from various sources in the UNIX community, while others have been created by SCO especially for Xenix. The overall quality of the manusla is very high, and SCO has made a valiant effort to tell you where to find various bits and pieces of information.

Still, finding a particular piece of information in this sea of manuals can be frustrating. Some of the lettering on the spines of the manuals is horizontal and some is vertical, making it hard to locate a particular volume. You can get dizzy from squining and tilting your head each time you reach for a volume. Following the cross-references is like participating in a treasure hunt. One reference sent us to the Serial

Measuring Xenix System V Against the UNIX Standard

This series of performance tests for UNIX systems was developed by Dan Ts'o, a neurobiologist at The Rockefeller University and a long-time UNIX afficionado. Parts of the tests are adapted from traditional UNIX programs developed at Bell UNIX programs developed at Bell

Labs during UNIX's formative years.
The traditional PC Magazine Labs
benchmark tests emphasize hardware
performance because PC-DOS, despite the different versions available,
is a constant. But in the UNIX maketplace, there are more variables.
Versions are written independently
and compiled by different compilers,
and UNIX vendors perform varying
and UNIX vendors perform varying

amounts of software optimization. The Ty's benchmark tests measure both the hardware and software performance of a UNIX system for ten standard tasks. They evaluate three aspects of system performance; computational, floating-point, and system. The tests summarize all the variance, producing a bottom-line appraised that disregards whether performance was attained through fast hardware or highly tuned software.

The standard machine used for comparison in UNIX system benchmark tests is the Digital Equipment Corp. VAX 11/780 super minicomputer running the Berkeley 4.2 Version of UNIX.

The test results presented here show the processing time (in seconds) and graph the AT's performance relative to a VAX 780. A relative speed of 0.5, for example, means the AT is half as fast as a VAX. We ran the benchmark tests at the standard 6-MHz AT speed and at 10 MHz—Robin Raskin and Kaupe Christian.

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manual page in the user's reference, but that page was blank except for a note directing us to the Serial manual page in the hardware section, which, we soon discovered, is located in the Run-Time Environment Manual. You'll need a big desktop to manage these manuals.

One of the problems with the documentation is due to the fragmentation of the software into three separate packages; the base system, the text-processing system, and the software development system. The awk program, for example, is part of the base system, and its manual page comes with the base system, but its tutorial document is part of the text-processing system. Similarly, the 1d (the program that is Xenix's linkage editor, analogous to DOS's LINK command) program is part of the base system, and the base system contains a manual page for 1d, but a much more exhaustive manual page for 1d accompanies the software development system. These manuals are tolerable, but you need to take a deep breath and prepare the dormant academician in you in order to survive.

Our biggest reservation about these namuals is their abundement of the traditional eight-part format found in older UNIX manuals. While UNIX's documentation may not be the user's ideal, it limpeccably organized. In Xenix, descriptions of the system calls and subroutines are combined in one section instead or two separate sections as in other UNIX manuals. The commands are described in two separate sections as in other UNIX manuals. The commands are described in two separate sections as under the command of the two sections as the description of the term coap file, seem to belong in other sections.

er exciton.

SCO offers a two-tiered support plan it quantity calls SoftCare Support Services. In the Level I plan, SCO responds only to written requests for software assistance. The postal system is an antiquated form of communications for a progressive comparty and price is refer on the communications capabilities of its operating system. Software the state of the software is the software in the software in the software in the software is the software in the software in the software is the software in the software in the software is the software in the software in the software is the software in the software in the software in the software is the software in the software is the software in the software in the software is the software in the software is the software in the software is the software in the software in the software is the software in the software in the software is the software in t

helpful, but less than timely; the support staff made us will a weeks for answers test framed us will a weeks for answers to several questions. The most disturbing of our questions concerned copy proteon. Xenix requires you to enter a serial number and an activation number before you can proceed with an installation; if you enter an incorrect number, Xenix won't boot. Obviously this is not disk-based copy proteotion at la DCS, but there is clearly some form of accountability. We will be supported whom we spoke said the number is used only as a way of tracking users for customer support.

EVERYONE'S CUP OF TEA? If visions of multitasking dance in your head, proceed cautiously with Xenix System V. The gap between single-user DOS and UNIX is large, and the bridge is rickety. Knowledge of DOS almost gets in the way of learning Xenix fundamentals.

With over 3,500 pages of documentation in seven manuals, Nentix is not a "let's give it a ty" system. The number and caulity of applications programs are still pretty stilm pickings even though the piction of the picking of the picking of the 'Off-the-Shelf Software for Nent''), and users with a DOS background are bound to find the applications complete but terribly obscure. Although the picture is changing, extris stall at its best in a programmer's environment or in an end-user environmenter out.

It's no hard to find a few glitches in any otherway stem that consists of 300 programs, and SCO's Kenix System V certailhy has shortcomings, but we fully expect continued improvement from SCO. Kenix's performance is excellent on an AT: we experienced no crashes in about a round month of hard, sciptorative use, and the many miscellaneous glitches and gothes of craiter Kenix Systems are abouen. Everything considered, Xenix System V is an impressive version of the UNIX system. W

Robin Raskin is a frequent contributor to PC Magazine. Kaare Christian puts together computer systems for vision research at The Rockefeller University in New York. He is the author of The UNIX Operating System (John Wiley, 1983).



Remote lets you run almost any program, from any location, as if you were there.

Remote is the software that turns your personal computer into a host computer. You or anyone you choose can dial it up from almost any terminal in almost any location, and run most popular application programs such as word processing, spreadsheets, and data base managers. You'll see the program on your remote terminal screen as if

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. You don't need a second PC to do the job of two. Almost any terminal or terminal emulator will do. The only software you need is the software in your host PC.

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COMPAG



Relatively simple flat-file managers are often passed over in favor of moresophisticated databases. Complexity, however, doesn't necessarily imply efficiency. These 18 DBMS's are worth serious corporate evaluation.

FLAT-FILE DATABASES

n the first segment of our three-part Project Database II series (Volume 5 Number 12), we looked at relational database management systems. These high-end products give you the ability to link separate files through related fields or even to create individual applications using the software's built-in programming language.

The flat-file database systems reviewed here and those reviewed last issue are more basic in structure: they accept information, reorganize it tind a variety of formats, and exhibit it neatly on-screen or on a printed page. These databases are therefore more limited in scope than their more sophisticated cousins and consequently may not be suited to large-scale business applications.

However, these products are not as humble as you might think. Most have slick interfaces and are quickly accessible to computer novices who can soon upload, add, resort, and print out data without spending long hours with tutorials. And, as you can see in the accompanying features table, many include advanced functions that would not be ord place in the most sophisticated DBMS software. In fact, although technically they may not be relational, some flat-file programs incorporate infel-linking features that place them very close to the boundary. A wise manager will take a close look at the following products before moving ont otheir more exotic relatives.

-Barbara Krasnoff

ALPHA/THREE

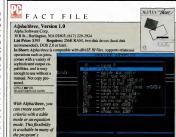
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oesign, internice, and teatures gill your file at a time. While it opens gill your file at a time, while it opens gill your file at a time, billities to make you question its categorization as a flat-file manager. It manipulates aBASE III files (including memo files) without importing, avitiches between form and browse modes, and permits user-defined data entry use. Other capabilities include a respectable report generator, section modules for creating mailing its and form betters, extremely powerful indexing and form betters, extremely powerful indexing for starching modes of the scarching for starching remodes and the section of the scarching for starching remodes.

Because the internal database formats are similar, Alphathree accepts all of dBASE III's field types (including Memo and a single of the singl

MORE THAN ONE MASS FILE YOU can eve work with more than one disc. file by using one of the relational commands: Join, Subtract, or Intersect. You simply log onto one database, select another er (which needs to be indexed) and then pick the fields that will appear in the new file. When I joined the Category 3 files into one file and ran the appropriate benche mark tests, the overall time from booting the program to printing the various reports to screen took a little more than an hour.

Importing files from other programs is



almost as easy. You select the appropriate file format from a variety of choices, have Alphalthree determine the fields and their lengths from the file, and optionally change any you wish.

features.

■ It opens only one file at a time, but Alpha/ three offers enough relational capabilities to make you question its categorization as a flat-file manager.

Alphaithree resembles Borland's Reflex in three areas: its use of pop-up windows for displaying selections, its use of form and browse modes, and its ability to rearrange columns in the browse mode. You can pop up a window whenever a menu requires input based on known critica, such as field anness and functions. You change from form view to browse view with one keystroke. (I hope a future version enables both views on-screen as the same time.) When in browse mode, you can rearrange columns so that, for example, the first column is alongside the last. The rearrangement can optionally be

saved.

R-base 5000's contributions include the
ability to set up data entry rules for checking ranges and exceptions. For example,
you can set up a case conversion function
so that data is automatically converted to a
specified format such as all upper case or
initial capitalization. You can also userules to create calculated felds.

POWERFUL INDEXING Like R-base 5000, Alphathrer discourages physically altering the database. Unlike R-base 5000, though, Alphathrer does not offer a sort option. Before you think this limits the program's usefulness, know that is indexing functions are extremely powerful and more than reasonably fast. With them, you can query or produce reports using any range of records in any order you like. Indexes can be based on one or more fields and they can include both ascending and descending orders. (The latter capability enabled me to produce a report with an ascending Department field and a descending Salary field.) You can even set the primary index to a stored search criterion.

Alpha/three's output capabilities include a notnourri of forms: input, mailing label, form letter, and full-fledged report. With the mailing-label option, you can print up to 999 copies of six labels across, and specify the number of columns between labels, the column width, and its height. Form letters can include prompts for keyboard input, boilerplates, and escape-code sequences for printer enhancements. Also supported are block-editing features, equations, and conditionals. The report generator permits calculated fields. three break points, title page information, headers and footers, and a summary section. You can globally format data for different types, specify the actual length and the window length, and suppress blank lines

As good as Alpha/three is, it is not for everyone. For one thing, its lack of a procedural language prevents you from creating a turnkey system. True, Alpha Software sends you a copy of its Keyworks when you turn in the registration card, but macros have their limitations; and you can port your database to dBASE III and its

 Alpha/three's output capabilities include a potpourri of forms: input, mailing label, form letter, and full-fledged report.

programming language, but that presumes you own dBASE III. For another, you may find its one line of help insufficient (I didn't) or its menus tedious (only if you are used to command-line processing).

Despite these limitations, though, Al-

pha/three should become extremely popular in a short time. It has everything a database should have: power, flexibility, and ease of use. Because of its compatibility with dBASE III, it even has something that only well-established programs have-access to previously created datafiles. Even if you never intend to use dBASE III, Alphaithree can answer most of your database needs.-Vincent Puglia

C.I.P.

C.I.P. (The Concentric Information Processor) from Concentric Data Systems is a first-class product in every sense of the

word. C.I.P. comes on three disks and is not copy protected. Installation on either a hard disk or floppy, which takes about 5 minutes, is extremely simple. The new user is greeted by a well-wrought manual that includes an excellent 200-page tutorial, a quick start-up section for more experienced users, and a well-written reference section.

C.I.P. is outstanding in the way it com-

municates with the user. The program utilizes a combination of function keys, menus, and an on-line help facility to effortlessly guide you through every feature. Once you get to know the program, it becomes a simple matter to quickly move from feature to feature.

The program presents its choices through well-designed screens that are easy to understand and use. Simple file and field definition enables you to quickly de-

fine a database.

A LOT OF DATA TYPES The program provides a wealth of data types, including date, calculated, must-fill, and unique types. Fields may consist of one or more data-type attributes; for example, a field might be classified as an auto, must-fill, unique field. Making changes to field definitions is a simple matter.

The C.I.P. system requires that you give careful consideration to file construction. Indexing is accomplished by designating key fields during file definition. Data can only be searched for on those fields designated as being key fields. While it is possible to define each field as a key, careful thought can keep file over-



FLAT-FILE DATABASES

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status at any time.

Once the database has been defined, information can be entered, changed, manipulated, deleted, and reorganized.

CLP. presents a basic view of the data fields, but an option allows you to lay a view out on the screen in a way that directly suits an application's need projection.

ONE KEY-FIELD SEARCHES
C.I.P: sonly limitation is that it bases a
search for a record on only one key field.
Compound field searching is not available.
Further, sorting can only be accomplished
through the report writer at the time of report generation. C.I.P. will allow sorting
on up to four fields, in either ascending or
descending order.

The report writer is excellent, C.I.P. al-

■ For basic singlefile data management, *C.I.P.* provides all the tools necessary to build and maintain real applications.

g lows report formatting in an interesting and unique manner. It presents you with a standard view of each defined field and then allows you to move each field about on the screen to create a free-form, customized output format. Totals, subtotals, and counts are all available options. Headers and footers can be added, and the program allows for extensive control of the printed output. The report writer also allows the printing of mailing labels.

C.I.P. provides more features than the usual simple flat-file databases. It can import and export DIF and ASCII files, it can merge C.I.P. files with standard ASCII files, it provides rudimentary password protection, and it can support a fairly large database (up to 65,000 records of 2,000 characters each).

For basic single-file data management, C.I.P. provides all the tools necessary to build and maintain real applications. It is a satisfying product to use and is highly recommended. —Tony Rizzo

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☑ no import or export ☑ import ☑ export ☑ both import and export • poor * average * good # excellent

COURTNEY DATABASE

The unlikely name of Courtney and a three-ring binder of documentation that is not typeset might lead you to quickly dismiss this database as second rate. But a closer examination distinguishes the Courtney Database as a first-rate file manager and report generator with an excellent selection of features.

Courtney starts up quickly and presents a menu of 18 choices from six function groups. You define the file structure of the database with the first choice on the menu. Each field receives a prompt that appears on the data input form and a name that appears on any reports that are generated.

■ Courtney's reportgenerator is powerful. If you want to produce a report quickly, you name the fields, and Courtney does the rest

However, the name is limited to eight characters, which often is not enough for reports. Fields are placed on the form by defining row and column coordinatesmuch more of a hassle than simply zipping around the screen with the cursor keys to define a form.

DATA HANDLING Field input spees give you a feel for what the program can do. Besides those found on most file managers, the spees also include must-fill fields, skipped fields, conditional defaults, and check digits.

Other menu choices in the file design group further enhance the program's ability to manage your data. You may issue constraints on the data input to a field, and you can establish code and fill fields. A code field is one, such as a ZIP Code field, that you can use to enter or fill data automatically into other fields, such as the City and State fields.

After you define a file and enter data

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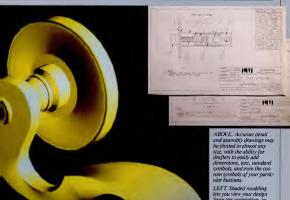
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REPORTING Courney's report-generator is powerful and flexible. If you want to produce a report quickly, you name the fields, and Courney does the rest. If you are disastisfied with the look of the report, you can shift the columns by entering unmbers that indicate where the columns should be placed. Special effects, such as breakpoints and subbotals, are also easy to do. (Remember, you're limited to eight characters on column headings.)

In addition to columnar reports, the Courtney Database also lets you generate detailed forms by specifying with row and column coordinates where text and field information is to be placed. Admittedly, this is not the easiest way to generate suchforms, but it is precise. A problem does

arise, however, when you generate mailing label forms. The program does not delete unnecessary spaces, so if the first name and last name are in two different fields on the input form, you could wind up with several spaces between the two on the label

Learning to use the Courtney Database is a snap because the program, documenta-

■ Learning to use the Courtney Database is a snap because the program, documentation, and tutorial are all well organized.

tion, and tutorial are all well organized.
The tutorial not only teaches you the basics
of the program, but through real world
mobbems and solutions it gives you end

insight into what the program can do.
Though Courney does have some limitations, they are greatly outweighed by its first-rate features and performance. If you're interested in a file manager and report generator of this type, you'd be well-advised to consider the Courtney Database.—Joe Desposito

THE DATA REPORTER

The Data Reporter is an interesting database that manages to display some impressive features, even though it does lack some basic elements. Notably, it doesn't import and export files. But a look beyond the program bugs and incomplete documentation reveals a sophisticated file manager in need of refinement.

Setting up basic data records in The Data Reporter is stringlistroward. Following the steps from the maser menu to the completion of the file setup is easy of are allowed a good range of field types and flexible calculated fields. A good report writer less you set up formanted reports, the about file of the composition of writer less you set up formanted reports, ports, tables, and form letters with other that link data in the setup file to the report format.

SORTING AND GRAPHING. The groups of Search and Sort features are particularly noteworthy. You can choose from six search types, including approximate spelling searches and impressive range searches. You can sort one or several subfiles, and this sorting tool is more than adequate for most users' needs. Both the Search and the Sort features execute at lightning speed. Also, a helpful batch command option less you program up to Office of the Comment.

The program's graphics package creates bar and line graphs, pie charts, and scatter graphs fast and easily. The Data Reporter will take your data records and within milliseconds will transform them into a bar graph. A few more keystrokes results in a statistical chart of the graph you just made, listing the field hame graphed.

FLAT-FILE DATABASES

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-Indicates Editor's Choice

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OUR REVIEWERS

Bruce Brown is a principal at Soft Industries Corp. and founding president of the Connecticut Computer Society. He teaches courses in business computer use at three Connecticut colleges. He is also cofounder of the Microcomputer Train-

ing Association.

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Christina Dyar is an editorial assistant at PC Magazine. Cheryl J. Goldberg is a staff editor at

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Janet Lewis is senior copy editor at
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Vincent Puglia writes frequently for PC Magazine and reviewed programs in our first Project Database in 1984. He has written for Changing Times, Video, and numerous computer-related newsletters and has edited books for the New York City Board of Education.

Dick Ridington is a consultant and principal at Soft Industries Corp. He is coauthor of Hidden Power of Lotus 1-2-3 Using Macros.

Tony Rizzo is assistant director of information technologies at New York University School of Continuing Education. He specializes in data processing office automation, personal computer training, and curriculum development. Rizzo serves as professional computer consultant for the school division of personnel and industrial programs. number of records graphed, and how the records are grouped. It's a complete visual representation of your data.

WHAT WENT AWRY? The Data Renorter still needs some work before it can compete with the top performers in this category. It's written in BASIC, and that's OK, except that on the version PC Magazine Labs tested, the program's error-trapping capabilities often went right into BASIC error messages instead of telling you in plain English what went wrong. Repeated testing of the same procedure often resulted in various BASIC error messages' being displayed for the same sequence of commands with The Data Reporter program. The Reformatter feature, for example, which lets you rearrange the fields in a data record, was particularly problematic.

BASIC prompts got in the way again when I exited the program and entered SYSTEM to go into DOS. A file that would let you go right into DOS would be helpful.

According to a Softwest Programming spokesman, a new version of *The Data Re*porter, scheduled for release this spring,

■ The Data Reporter

will take your data records and within milliseconds

will transform them into a bar graph.

will iron out some of the bugs I encountered, such as troublesome multiple file sorts. The company spokesman also claims that the new version will be able to import and export data files.

If Softwest Programming would work on the BASIC error messages and comb hrough its documentation to include revised descriptions of, for example, installation of the program on a hard disk, this database would be easier on the eyes and on the nerves. In its current version, The Data Reporter comes within inches of being a fast and mean database for the price.—Virginia Dudek

DATAPLUS-86

If you've never used a database management program before but your data management needs outweigh your resistance to learning a new program, Professional Software Inc. has an answer. DataPlus-86. This menu-driven database is easy to learn and use. On-screen prompt guide you through every menu operation, and the printed tuorid and reference manual

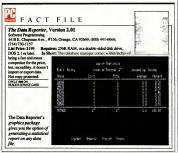
are as thorough as you'd usuat them to be. Except for the initial process of defining records, which the program takes you to automatically. DataPlus-56 revolves around its menus: the main menu, the global menu that is responsible for search and replace and other global update functions, and the utilities menu that lets you add files, print field titles, change file titles, and so forth.

Both using these menus and the menu operations themselves are straightforward. You don't even have to learn commands. You simply make a selection from one of the menus, and then follow the prompts at the bottom of your screen.

You can use the field titles that Data-Plus-86 suggests or create up to 24 of your own. For the database to process your data correctly, you must follow the prescribed methods for entering field titles. For example, field titles containing dollar amounts must begin with a dollar sign, integer field it titles must begin with a number sign (#%), and date fields must begin with the word date.

In addition to holding text, fields can contain mathematical formulas that perform calculations between two other fields. To ease data entry, the program also allows you to import and convert ASCII files into a DataPlus-86 format, as long as the data for each field is followed by a carriage return.

SORTS AND REPORTS DataPlus-86 gives you a nice variety of data manipulation and report features. The sort feature lets you do two-level sorts or create an index. The report generator allows you to make data tables, which can include mathematical calculations. You can specify page breaks as well as print titles and notes on your reports.





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The report generator's record selection screen lets you specify criteria to limit records included in a report. These limits include wildcard character strings, exact character matches, and numbers less than, greater than, or equal to a number you choose. The report generator screen is also present in the mailing label feature, so that you can, for example, restrict the ZIP codes to which you send letters. The package also includes the as yet undocumented ability to merge files into a word processing file. (The program's documentation should include a description of this new feature by the time this article is published.) With this feature, you can give DataPlus a letter and it will insert the addresses automatically.

In the memo window format, you can "paint" the position of your field titles and attach notes up to 1,000 characters long to records. The memo window can contain text and numbers and perform calculations. You can even create a format in one record's window and call that format into another's. Unfortunately, you must type: in the memo window at about huria-and-peck speed. Type any faster, and the package losses characters. NO SHORT CUTS Although the menus and the prompts make all the program's features easy to use, they also make Data-Plus-86 clunky. You can't skip to the features you want; instead you must respond to prompts for all features provided in a particular menu operation. The Quick

 In Dataplus-86's memo window format, you can

"paint" the position of your field titles and attach notes up to 1,000 charac-

ters long to records.

Scan and Super Scan features, however, compensate somewhat by allowing you to sprint to records in which one field contains characters that exactly match those you specify. Super Scan also lets you quickly add, delete, or edit records. The program's prompts can make the program cumbersome to use if you know what you're doing and want to speed through your tasks, but the Quick Scan and Super Scan features compensate for that to some extent. DataPlus-86 is best for the person who cherishes ease of learning above all else. —Cheryl J. Goldberg

FLEXIFILER

Anyone who wants to maintain simple banks of information (mailing lists, for example) in a straightforward and easy way will appreciate Flexifiler from Sound Decisions. At \$79 the database program is definitely well priced, and it is robust enough in its features to provide users with an adequate amount of control and flexibility for many simple applications.

The Flexifiler system comes on one disk and is very easy to install. It is not copy protected, and installation consists of copying three program files to either a blank floppy or a hard disk. There are no configuration issues, and once installed the program is invoked by typing "flex" at the system prompt.

Flexifler features an uncomplicated step-by-step approach to accessing all of its functions, providing, in most cases, simple number or letter choices. An initial menu lists available database files, which can be recalled, deleted, or merged, and an option to create new files. Existing database files can be reoparaized, and one file can be selectively merged with another. The merge option also allows you to divide a database file in two.

Within this framework, once a database file has been established, records can be added, changed, or deleted, as well as searched for and displayed. Fields within a record can have a number of standard types. Welcome surprises are the inclusion of calculated fields and the ability to carry repeated data from record to record through a simple one-key process.

Basic reports can be created through a built-in report generator, which will sort on up to three fields and report subtotals and totals on specified field breaks. The report generator will also allow you to send printer control codes to your printer, a

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valuable feature. In addition, Flexifiler lets you save report formats for future use.

SMMILE BUT LIMITED Simplicity always has a price. In Fettifier's case, a
number of limitations make the system unsuitable for many projects. There is no
ability to set up indexes, and sorting can be
accomplished only when creating a report,
therefore, searching a relatively large database can be a time-consuming task. The
report generator, while easy to use, is limitted in its formatting capabilities.

The greatest drawback to using Flexifiller, however, is its complete inability to import or export data of any kind, including ASCII files. Data can be input only from the keyboard. The lack of import or export capabilities has obvious implications for users whose applications require mail-merge capabilities.

NO SURPRISES Flexifiler works exactly the way it's supposed to work. The manual is accurate and clear and includes suitable examples that will allow anyone to get the system running in a matter of minutes. Though somewhat limited in functionality, Flexifiler can be traised for the

well-behaved manner in which it works. While almost any database system will provide the services Flexifiler provides, very few can provide them with so few complications.—Tony Rizzo

FORM MANAGER

Form Manager's strong suit is creating onscreen versions of paper forms. Its typical uses are creating and maintaining customer lists, invoices, sales orders, budgets, and expense reports. Once you create the form and associated data file, the program's ability to draw lines and boxes on the screen and its flexible field definitions make data early easy. Form Manager also has an extensive facility for calculating formulas on-screen.

BIT Software's Form Manager package includes four components: Forms Editor, with which you design and change forms; Data File Create, with which you create or set up your data file; Data File Manager, which is for data entry, retrieval, and calculation; and the optional Report Writer, which summarizes and brints in

formation in your data file.

Defining an input form is easy. Using the Forms Editor, you simply move around the screen and type in field labels anywhere you want them, à la PFS:File. If you want to be more fancy, Form Manager makes it fairly simple to draw boxes around and lines within identified parts of the screen.

Actually defining the fields is a bit more complicated, requiring you to mark the beginning and ending points of each field and then to fill in or accept the defaults of a very functional field definition screen; You can choose from nine data yea; set ranges, defaults, and other automatic entry-checking facilities; and specify screen attributes such as reverse video or blinking text.

DATA FILE MANAGEMENT Once you be defined one or more forms, you then use the Data File Manager part of the package. You use this program to retrieve a data file for entering or changing data, and the package for use cred, reviewing or updating records, defining formulas, and calculation or executing macros or formulas in-you can choose up to ten forms or pages per file. You can later ruse individually defined forms, or pages, for different files—a very useful facility. While choosing forms for the datafile, you can also in-dicate up to ten fields as index fileds.

which will be continuously updated.

The last step in getting your file ready for data entry is to put in any desired formulas. Form Manager's math capabilities include several built-in math and trigonometric and statistical functions, as well as a macro capability for repeating formulas.

Data entry, updating, and editing take place within the Data File Manager. Form Manager uses the PC's function keys and Alt key combinations extensively; two templates come with the program.

REPORTING Report design with Form Manager is limited to columnar and label formats. In each case a series of questions leads you through report definition. You are required to indicate field names and the page column number where each field will start printing; I found the process somewhat tedious. BIT Software sells the op-

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THE VERY THOUGHT OF NETWORKING WITH A WIMPY DATABASE TERRIFIES ME, EDNA.

■ Form Manager makes it fairly simple to draw boxes around and lines within identified parts of the screen.

tional Report Writer program for more complicated reporting.

Reporting aside, Form Manager's pieces are fairly easy to use and powerful. The program is marred, however, by a difficult manual. I found moving between various program components confusing at micros, and the organization of the manual and often found the information in needed only after more searching than should be necessary. In addition, the manual's sturfind a is disjointed. The on-disk tuorial is much better, but it's not interactive—you just sti and watch.

Form Manager is a very flexible onscreen form-emulation program with powerful design and calculation features, but it could stand significant improvement in its manual and more flexibility in report writing. —Bruce Brown

FRAMEWORK II

The database module of Ashton-Tate's Framework II is a fast, flexible file manager. With Framework II's five other modules—word processing, spreadsheet, graphics, forms processing, and outline generator—it forms an integrated software package that retails for \$695.

Framework II loads an entire database file into memory, which accounts for its speed. The maximum capacity of a file in a 60 Ke byte system, however, is approximately 1,000 records of tent ten-character fields. If any other frames (frames are similar to windows, except that frames can contain other frames), such as a word processing or spreadsheet frames, are open, even this capacity is diminished. For larger database files a vittual-memory configuration of the confi

tion option lets you use extended memory or a hard disk. However, this option slows the database manager considerably in such basic functions as copying or deleting re-

To create a database frame, you first choose the Database option from the Create menu. A blank frame opens with a default size of 50 fields by 100 records. Field names are entered as column headings along the top row of a table, which looks very much like a standard spreadsheet except that there are no lettered columns or numbered rows. Once you enter the field names, you can then change the view. Pressing the F10 key shows you a Framework II-generated input form. You can change the size of the input areas, which are actually small frames, and move them around the screen to create a custom input form. One more press of F10 gives you a dBASE II/III input form.

The program has a quirk relating to data input. To differentiate number fields from character fields when the input is ambiguous—a phone number, for example—you must first enter a space. This less the program know that the number you are about to enter is the start of a character field. The program doesn't allow you to define the field type any other way.

FAST SORTS Sorts on any field are lightning fast, less than half a second for the 25-name list in the PC Magazine Labs tests. Although only a single-level sort is available on the men, other features of the program such as selecting and sorting on subsets of the file to you circumvent obstacks like this. Breakpoints are not featured on the mem, but you can produce them on reports by deleting duplicate emotive the program of the provided of the memory of the provided of the memory of the provided of the memory of the provided of the prov

Framework II slows down when constructing a calculated field. One field that calculated a salary bonus took 11 seconds for 25 calculations. The same calculation took 2 seconds in the spreadsheet.

Framework II automatically loads imported ASCII files into a word frame. You must then copy this information into the database frame; doing so takes only a few keystrokes.



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■ FLAT-FILE DATABASES

ADDED POWER Framework III's integrated nature gives the database module added power in many areas. For example, you can create graphs from database information, link spreadsheets and databases dynamically, and print reports in a variety of type styles, including headers and footers. In addition, you can use the word frames and the database frames together to create form letters and mailing labels.

To top everything off, Framework II supports abbreviations and macros and includes a programming language, FRED. Abbreviations are two or three-tetter omnads followed by Alt-Backspace that will bring up a longer string of text. Macros are formulas or sequences of commands that can be invoked by pressing a two-key sequence. FRED can be used to design customized databases. Framework II's database module per-

formed quite well on the PC Labs tests. I especially liked how it created reports exactly the way I wanted them to look (albeit not with dedicated commands). Many standalone file managers restrict your flexibility in report eneration.

Framework II is not likely to be the right product for you if your database files

are several thousand records long. But if your files usually don't exceed several hundred records and you need more than just a standalone database, I highly recommend Framework II.—Joe Desposito

GOLDENGATE

Goldengate, from Cullinet PC Software, is one of the major players in the integrated software arena. Cullinet, widely known for its mainframe software, has used its experience to produce a first-rate package for the personal computer user.

The entire program takes up a substantial amount of space, and it would be unrealistic to consider using anything other than a hard disk for operation. Installation is not difficult. Cullinet uses an interesting setup- once the program is installed on the hard disk, all program files are hidden from view. A Directormand reveals only the small GG.COM file. Entering GG at the system prompts fire a user the system prompts for a user dengues execut, which prompts for a user to the full ordiness mean.

VARIATION ON LOTUS Since Gold-engate uses a variation on the Lotus command structure, 1-2-3 and Symphony users would feel completely at home using the software. Program modules, which Cullinet calls tools, can be chosen from the main menu or called from any other module. Butabase information can easily be transferred to Goldengate's other modules.

The database is based on the spreadsheet model; in fact, it is in reality a spreadsheet. Data is organized in rows and columns, and you must work within such a framework for all database tasks.

The system provides a useful collection of features. Most interesting is Goldengate's ability to link data from more than one data file through a common field. Cullinet calls a disolay of data a view.

Goldengaie links different data files and presents a view of the resulting data as defined by the user. This ability borders on the typical relational abilities of Category 2 products and is a welcome feature. Goldengate even provides a Select command, which is used to search for data based on user-defined criteria.

Goldengate will sort information based on one or more column values, in accending or descending order. Unfortunately, it has no indexing capability; you must rely heavily on sorting to keep performance at an adequate level, which involves you too intimately for my taste with the maintannee of data files. Indexing would provide a substantial improvement to data access.

CREATING A VIEW Reports are completely linked to views. You must first determine what data files you need and then sort and link those data files to create a view. Once the view is created you can print it.

Reports can provide a relatively sophisticated collection of data because of Goddengate's ability to relate and link data files. In another sense, the reports are limited in that they are simply printed versions of the view.

The database by itself lacks most of the report-writer features found in most true database managers. However, by using Goldengate's edit tool, you can probably produce more-substantial reports. This



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still requires a bit of work on your part.

ucts.-Tony Rizzo

still requires a fix of work on your part.

Goldengate is not inexpensive and cannot be recommended simply for its database. In the integrated software market, however, Goldengate should be given careful consideration. Its relational ability may give it an edge over similar prod-

INFOSTAR PLUS

InfoStar Plus, a file manager and report generator from MicroPro International, has some outstanding features. The program consists of InfoStar, a tutorial, and Starburst, which is a menu-generating program used to develop tumkey database systems.

systems. When you bring up InfoStar, a menu the type that you can create with Starburst with five choices appears. After you select appropriate choices from first- and second-level menus, you can begin to develop a file input form by entering information or a blank streem. You denote input fields by typing the underline character a specified number of times to establish field width.

One problem you encounter when you create a form is that you need to use Ctrl key sequences to navigate around the screen—the cursor keys are disabled.

SOPHISTICATED PROCEDURES After you've created an input form, you must choose a key field. Then you may assign attributes to any of the fields. This feature allows for sophisticated data entry procedures and error checking. The fileaccess attribute, for example, relates a field from one file to data in another file. Suppose customer number is included as one of the fields on a form or record. You can link this field to another file that has customer number, name, and address. When you enter the customer number on the form, the name and the address of the customer from the other file are automatically input into appropriate fields on the current form

One of the more-sophisticated errorchecking attributes is called file verify. Here you may enter a state abbreviation such as NY in a State field. If you have assigned a file verify attribute to the field, InfoStar will automatically check your entry against a file that has state abbreviations. To keep track of any attributes you may have assigned to fields in a record, you can print them out.

Help screens are ubiquitous in InfoStar, normally occupying the upper third of the screen. And they are needed, too, at least until you become very familiar with the product, because most commands are con-

• When you create a form in InfoStar Plus, you need to use Control key sequences to navigate around the screen—the cursor keys are disabled.

trol key commands.

Some of InfoSur's menu selections, commands, and modes are not as clear or intuitive as they could be. If you want to search for a record, for example, you select Earler Data from the menu. Then once mank" to conduct your record search. In other parts of the program, you select a command that says "Save form and boot operating system," which actually returns you to the ment from which you sturted. Lucklify, these examples are not typical of the command that says to the threat which was to the command that says the same that the

TWO KINDS OF REPORTS The program can generate two kinds of reports: the quick report and the custom report. With the quick report, InfoStar does most of the work; with the custom report, you paint a layout on the screen and embed somewhat cryptic commands similar to the dot commands WordStar uses.

In one sense, the report generator, like the file manager part of the program, has sophisticated capabilities. It can generate reports with fields from more than one file, for example. But when I tried to senerate a

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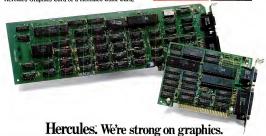
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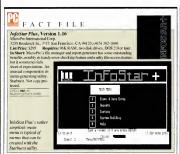
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simple report that had breakpoints done a certain way, the quick report feature couldn't handle it, and the custom report feature did so only with some difficulty on my part.

You can learn the program by using ci-

ther the printed or the disk-based tutorial.

Though both are good, I preferred to use the clear, well-written, and nicely illustrated printed tutorial.

Although InfoStar Plus is a quite sophisticated file manager, it doesn't always take full advantage of the capabilities of the machine that's running it. Potential sers should be ready to live with InfoStar Plus's occasional limitations as well as its benefits.—Joe Desposito

PALANTIR FILER

If you have a mouse on your desk and Microsoft Windows on your hard disk, you may want to add Palantir Filer to your office arsenal. Palantir Filer is a menu-driven, flat-file database manager whose main distinction is that it turns under Microsoft Windows. Palantir Filer works exclusively through the screen-painted forms, or templates, that you set up for data entry.

A DOS version is available that runs a triffe faster than the Windows version to it lacks a few of the features that make the Windows version casier to work with. Tim Farrell, one of the program's authors, says that Palantir Inc. is concentrating its marketing efforts on the Windows version and has no plans to update the DOS version. Palantir also offers a version that comes with a run-time copy of Windows on four floppy disks.

The Windows version smoothly implements the Windows interface, and, like Windows works best with a mouse. If you don't harbor rodents, you can use a combi-

nation of function keys, Ctrl-letter combinations, and cursor highlighting to enter commands, summon drop-down menus, and choose menu options. In the DOS version, which has submenus instead of dropdown menus, you can use cursor highlighting, function keys, and the first letters of menu choices.

Palantir Filer works exclusively hrough the screen-painted forms, or templates, that you set up for data entry. Once you load your data into the form, the form and the file become one entity that you can use to perform quick multilevel searches using Boolean logic, create multiple indexes, and generate reports. But before you can get a report, you must design a report form.

In addition to Character, Numeric, Integer, Calculated, and Floating-Point fields, a Palantir Filer form can include fight-yaisfield, read-only, and invisible field tragist-busified, read-only, and invisible field tragist-form design to guide, easy, how to do it. However, although the nicely printed loose-leaf manual is fairly well written and has some helpful camples, it doesn't make the procedure for defining the design of the procedure for defining the design of the desi

A MURKY MANUAL The manual, in fact, is Palantir Filer's most glaring weakness. It has step-by-step explanations of all major functions, an index, a table of contents, and several appendixes-but no description whatsoever, in either version, of how to use the interface. Windows users, I suppose, might be expected to learn the ropes from the Windows manual, but evervone else is left in the lurch. Where the interface is explained, the explanation is murky. For example, the only mention of the function keys, which are essential for editing records and forms, is buried in an appendix of the DOS version's manual. The manual uses only Palantir's own function key names; to find out which PC function keys correspond to these names, you need the program's plastic keyboard template-which did not come with my first review copy.

Farrell says that Palantir is revernping the manual completely for its upcoming

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new version. The update will be free to registered users, but Palantir will change a small handling fee for the new manusching manusching fee. For the new manusching expand Palantir Filer's file-import options. Currently, Palantir Filer can import only files that are in its own format. The new version will be able to import standard, comma-delimited ASCII files and make direct use of dBASE II and III files.

DOS VERSION The DOS version, which I used for the PC Magazine Labs benchmark-test timings, has a few rough spots that Palantir has polished smooth in the Windows version. It requires special filename extensions; without them it won't recognize the file or save changes to existing files. The Windows version handles these extensions automatically. Also, the DOS version gives you no directory listing for your forms and data files; to find out what you have, you must exit to DOS. The Windows version gives you a list of available files to select from. In the DOS version, when I tried to send a report to the printer when it was off-line, the program dumped me into DOS with the cryptic message "Processing line:1 write fault er-

ror writing device PRN. Abort, Retry, Ignore?" and promptly crashed when I chose Retry. The Windows version resisted my attempts to crash it, and its message, while only slightly less cryptic, was at least attractively boxed with the Windows graphic for error messages.

If you stick to the Windows version, you should find Palantir Filer an attractive, efficient addition to your Windows library. It handles the basic database tasks swiftly and painlessly, and its Windows environment gives it the advantages of multitasking and networking absent in many similar products.—Janet Lewis

PC-FILE III

PC-Fiel III, the popular program from Jim Button's Button'War, is a nead-and-potacos flan-file database that gets the job done without sophisticated side orders or an expensive price tag. At \$59.95, PC-File III is a strong price performer for the inexperienced or weekend database user who needs a speedy database. With a no-netsense approach.

PC-File III's tutorial is simply in silm namal. The program comes without a disk tutorial, sample database files, or many examples scenarios, but it really doean't need those aids. The manual's manual other thickness, but you probably won't need to spend much time on the manual other than for occasional reference. After you're more familiar with the program, you can configure your databases individually, allowing for different confidences of the manual other than the control of the confidence of the confidence

Installation is self-explanatory. The setup program carries you through the normal system, configuring as well such program system, configuring as well such program ways to start with the same database; if you want every change written to disk, and whether or no you want the safety of hitting F10 or Enter twice before your data is accepted.

DEFINING A DATABASE During the start-up, if you choose a database that doesn't yet exist, PC-File III automatically loads its PC-DEF program and brings you immediately to the database definition screen. (If you want added security, an exclamation point after the database name will encrypt your data from all but the defined password holder.) All you need to do is enter up to 42 fields of 12 characters or less and the field lengths from 1 to 65-except for your last field, which you can designate as a Super field. This Super field, used only with 20 or fewer fields, is space for comments, notes, or any other lengthy text. You can also designate Numeric Data fields or fields with automatically generated input such as dates, times, and address-

es. You choose desired functions from the PC-File III master menu by entering predesignated three-letter abbreviations or appropriate function key commands. Records are added one by one, each displayed separately. You can then modify, delete, display one record or browse through all, and find records through wildcard, scanning, and "sounds like" (soundex) searches.

Most operation modules are simple and self-explanatory, with plenty of prompts. The more complex reporting function,

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however, leads you through a lengthy and cumbersome process of creating report towars, field selection, according to the control of the contr

are actuary precenting command strings. Through the master menu, you can also request sorting (including roman numerals for outline processing), binary searches, global updates and deletes, smart key croations (defining open Alt-key combinations), and edit masks for controlling fieldname input.

INTERNATIONAL APPEAL Button-Ware's inexpensive and speedy database has long been a popular favorine. It's even been translated into over 13 languages, including Arabic and Icelandie. PC-File III's approach, however, is a two-edged sword, searchiefing flexibility for each use and speed. Nevertheless, in its fountversion, PC-File III's a strong candidate in the basic flat-file category.— —Christian Bysy.

PEACHTEXT 5000

PeachText 5000's List Manager is a simple-to-use but fairly flexible program for working with single files. List Manager's extensive use of fill-in screens to assist in determining exactly what is needed to get the job done is a simificant benefit.

the job done is a significant benefit. PeachTear 5000 is an integrated package that also includes the PeachTear Worf Processor, Random House Electronic Thessaurus. Spelling Proofreader, and least Manager component is primate installed from maintaining address files to install the program has facilities for several data management as well.

PeachText's List Manager allows only a limited number of records, a maximum of 14, but many users may find that number ample for address files or list documents to work with form letters.

THREE INDEXES All fields with List Manager are alphanumeric text fields, without the fancy range-testing and various field types of some other programs. You can, however, set assumed or default field entries quite easily; this feature is very helpful when you must enter the same data over and over again. The ability to declare three indexes per file, which are constantly updated with new entries, and the ease of combining even dissimilar files

lend a lot of flexibility to the program. You cannot sort PeachText's List Manager files except during the reporting process. For most users of this scale product, sorting is not at all necessary, especially with the ability to declare three concurrent indexes. When you do sort during the reporting process, you can sort on up to three levels, yielding, for example, mailing labels in order by state. ZIP code within state, and last name within ZIP code. As with most List Manager functions, you specify sort fields for a report by using a fill-in screen-a very clear way of working with what could otherwise be difficult concents and commands

PeachText's List Manager is especially good at creating label printing formats, and it comes with ready-to-use or customized formats for mailing labels and continuous form index cards.

FIVE DISKS TO LOAD PeachText 5000 comes on eight disks, counting the two upgrade disks called The Toolkit. While List Manager itself only requires 121K bytes of disk space, hard disk users must load five disks' worth of program as well as parts of the other disks for the program to be installed correctly. The only drawback in installing the program I could find was that information for installing dual floppy drive systems is in the front of the manual and hard drive instructions are in an appendix. Otherwise the installation process is very clear and even gives you reassuring on-screen messages if all went well-a nice touch

PeachText comes with a reference guide and a lesson-plan tutorial manual, I found both volumes very helpful and their indexes accurate.

List Manager by itself may not be a terrifically strong database management program, but it is not intended to be. The program does what it is supposed to do: it works well with simple files and offers a sound list or file management facility to users who have a primary need PeachText.





5000's other functions. The program's ease of use and integrated combination of features have made me a loyal fan.

—Bruce Brown

PERSONAL DECISION SERIES—DATA EDITION

EDITION

The IBM Personal Decision Series—Data Edition, a full-bodied flat-file database, lays the foundation for the other members in IBM's Personal Decision Series (PDS) family. As a standalone package, PDS Data is a competent and able database with some timesaving features.

One feature that won't save you any time, though, is the program's bully 600-page manual. Excessed in an 11-by S-linch binder, the manual is sure to stick out on your bookshelf, although the binder lies flat when open so you don't have to cope with flying pages. Despite the concise glossary, bullet-listed recaps of processes, bullet-listed recaps of procesures, bullet-listed reminders, and a 208-page tutorial, I found the documentation conclusing and ankward L large flighting.

■ To save keystrokes in PDS Data, you select menu choices, functions, and files by rotating your choices for a task with the F9 or F10 key.

back and forth between the glossary, the tutorial section, and the "Using" section. The on-screen tutorial presents a good overview of the program if you just want to get up and going. Unfortunately, to make the best use of PDS Data, you'll have to spend hours reading and rereading the manual.

Program installation is straightforward but lengthy. It took me 10 minutes, which seemed like forever. First you install the three program floppy disks and then three more, product-enhancement, update, frogpies (four if you're updating communications, too). The Install and Update Replace programs prompt you along the way while you play the disk-shuffle game.

MENTI DRIVEN After PDS Data is finally installed and you've read IBM's version of War and Peace, the clean and easy menu-driven program is a refreshing change. PDS Data opens to the Files menu, which offers choices such as Define File: Define Sort: Define Additional Index, which lets you build up to six additional definitions if you want more than one way to access your records; Enter Data; Query File, which selects records with If-And-Or logic, displays or prints records, totals values, and performs calculations on two numeric values; and Copy File for cloning, reformatting, and converting files from BASIC, TEXT, or DIF files to indexed and direct files. From a window on each module's opening screen. you can switch among the Files Menu, Applications Menu (for creating procedures), Communications Menu, and Utilities Menu (for maintaining libraries).

Function key commands appropriate to the menu you' in a rat also displayed. For example, in the define fields screen, commands include help, insert field, rem, and cancel. To save keystrokes, you select menu choices, functions, and data fleammes by rotating your choices for a particular task with the F9 or the F10 key.

To help you enter data more efficiently, PDS Data lets you specify entry codes to determine what you see and use. You can also set up data verification codes and masks.

TIME SAVERS The Applications model use includes two helpful features, creater run procedures and a run program. If you have a series of lasks you perform repeatedly, you can link a group of PDS Dana that a group of PDS Dana that a group of PDS Dana that a procedure feature save supplies such as record and field section. With the procedure feature, for instance, you could define, sort, and print an expense file. If you want to enter some insequent flags of the procedure feature some insequent flags of the procedure feature some flags. If you want to enter some familiary on want to enter some familiary of the procedure feature some flags.



procedure. At the time you run the procedure, you can enter the desired information at the Enter Substitute screen. If not, PDS Data will stop for you to enter the correct variable.

The run program feature lets you access Report+, another member of the PDS family that gives PDS Data relational capabilities, or temporarily leave the PDS environment to run a BASIC program, DOS. COM or .EXE program, or a .BAT file.

1BM Personal Decision Series—Data Edition is a solid base for the PDS family of software. Alone, the program functions as a well-rounded but unexciting flat-file database.—Christina Dyar

Q & A

Q & A. Version 1.1, is the Thoroughly Modern Millie of the database set. Although still a relative newcomer on the scene, Q & A presents a polished, easy-touse data management environment augmented by a pioneering use of artificial intelligence. If you're unincreased by the trendy dazzle conferred by the presence of AI, you'll be pleased to know the program stands on its own quite nicely without it. O & A includes a file manager, report

manager, and a word processor—all workalikes to their counterparts in the PFS-sIBM Assistant Series. As with the PFS-siBM Assistant Series, the most striking thing about $Q \in A$ is the case with which it works. I read a paragraph or two in the clearly written manual, quickly deinfined a data file, and—no muss, no fuss imported a comma-delimited ASCII file; I was ready to go to work.

The program has special support for importing ASCII, DIF, PFS:File and 1-2-3 files, but export is limited to DIF or ASCII files. If you intend to use this program in an environment dominated by users of some other database, at least they won't be able to quarrel with its accessibility.

DATA ENTRY The process of file definition tells a lot of the Q & A story. Most data management programs fall into one of two categories: either you define the fields and the program generates a default data entry screen, or you must define fields as well as design a default data entry screen.

Q & A compresses that process (read: makes easier) so that as you design a default data entry screen, it does a lot of the work of defining the associated fields.

Rather than some nullimentary, specialpurpose editor to design data entry screens, you have the service of Q & h^2 , capable word processor, including a linedrawing command useful for boxing in sections of the screen. Field lengths are determined by the amount of empty space on the data entry screen to the right of the field name. Although you can use a terminator character to explicitly limit field length to a feet on the wheel of the or held not defect on the fieldings requirements. So why bother?

Q A A fields can occupy up to an entire 21-line szerea, and any record can have a maximum of 10 screens (whith that limit, any number of fields is permissible). And with the ability to perform substring scarches on the contents of such fields, Q A doesn't ignore all that data. Say that the content of the contents of such fields, Q A doesn't ignore all that data. Say that the content of the con

DATA MANAGEMENT Specifying a 18 search for information in a Q & A dataset in a 10 search for information in a Q & A dataset in a 10 search for information in a Q & A dataset in takes the familiar fill-in-the-form approach. You'll need to master some proach, You'll need to master some greater than or less than, but ample greater than or less than, but ample greater than or less than, but ample of greater than or less than, but ample you can use calculations as input of you can use calculations as input of you can use calculations as input on greater than or less than the propose that you construct for that of the program cannot reference a data file through a batic lookup.

Consistent with its emphasis on ease of to use, Q & A offers a colloquial approach to indexing in the way of a menu choice called Speed Up Searches. Multilevel sorts are available in combinations of ascending or descending order, but sorting operates only on the output of a query, not the class of the state of state state of state state

As easy to use as O. & A's methods of



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manipulating data files are, Symantec iffine deas of the to now height by including a natural-language-based assistant facility. Out of the box, the Intelligent Assistant can interpret an extremely limited set of English-like instituctions and convey them to Q & A's file or report manager for excution. The hidden strength of this facility is its ability to associate a much larger number of terms with the few primitives it already recognizes. While the Intelligent Assistant cannot expand what Q & A's file manager can do, it can significantly lower between the control of the co

The price for such convenience is no curriety paid when you hand over a piece of your paycheck for Q & A. The Intelligent Assistant needs to be "sugglit" about each data file you create, and there are some cledys, below in data entry and when some it specifies using the life manager when it specifies using the file manager directly, Q & A does a great job of informing you when it will require some extra time, and about how long a delay to cxpect. Somehow, I don't mind waiting so much when I'm treated with such consid-

Nonetheless, the time needed to complete the one-time-only "instruction" for each data file can be about 20 minutes, and the process can require as much or more skill than performing queries without the Assistant's help. So for an inexperienced user, the Assistant may be most effective when an experienced person handles the configuration work. Even after you teach it, the Assistant is a bit slow to use; it must ask you repeatedly to make certain choices, and misinterpretation is at risk. For example, I asked O & A to show me all the people living in California. Although I intended "all" to mean "every record where STATE equals CA," O & A interpreted it to mean "show all fields." When I removed the word all from the ouery ("show me the people living in CA"), the result was a list consisting only of the STATE field.

TRADE-OFF The experienced person has a trade-off to consider: spend the time teaching the intelligent Assistant and put up with some reduction in query response time to take advantage of its alluring En-



■ Consistent with its emphasis on ease of use, Q & A offers a colloquial approach to indexing via a menu choice called Speed Up Searches.

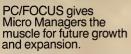
glish-like query syntax, or work directly with the file manager. The bottom line on the subject is this: you may not always want it, but the Intelligent Assistant is nice to have around when you do.

The word processing module means that mail-megie is a menu-driven option in $Q \notin A$. While it deserves credit for automatically suppressing print lines containing blank fields, the program cannot rejustify lines of text when the length of a field causes the text to exceed the current margin, $Q \notin A$ offers a built-in macro processing.

sor that features keystroke recording and hybokach, but it would be more useful if it gave you a menu of available macros from which to choose. You can edit much on the control its with Q A A's word processor, but the macro processor lacks commands with which to passe for user input or perform simple-cal control can be exerted in during data entry. A simple sale in which some control can be exerted in during data entry. A simple sale of programming statistically calculate entries or move the cut-sort to different field in the record.

Q & A not only excels in ease of use, it has a superb manual, an on-disk tutorial, and sample data files to move you through the learning curve smoothly. Keep in mind that the program has a large appetite for RAM (512K bytes). On a floppy system, frequent disk accesses and some disk swapping will slow you down. Q & A's Intelligent Assistant is a fascinating technological achievement, but it seems most appropriate for inexperienced users, who may need some coaching to configure it correctly. Nevertheless, even if you never use the intelligent Assistant, O & A is a capable, comfortable data management tool.-Dick Ridington



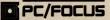


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The Assistant

LAN Support

OUERY III

Query III is a simple flat-file program that performs basic data-handling functions. The program is especially good at simple file applications that do not require elaborate reporting capabilities.

Query III uses a simple-to-use menu format for program function choices. Designing a file and entering data are both very straightforward.

GENILE TUTORIAL. The user manual is one of the nicest features of the program. The manual is unassuming and leads the user clearly through copying the distribution disk, which is not copy protected. Once the program is ready to run, the manual guides you keystroke for keystroke through the tutorial process of setting up a phone list file.

The manual uses a double-level approach to explaining the program. The fine is the keystroke uttorial in which most of the program's basic functions are experneced. The second level is a more complete explanation of each of the major program parts. The tone throughout is gentle and reassuring. That reassurance is needed later on.

ARCHAIC USER INTERACE Once you've built a file and entered data, the program's View function lets you look at, edit, and mark records in the file of edection. At this point the program begins to get more difficult to use because their commands to direct the viewing are single letter. Typing H when prompted for a command will display the list of appropriate is not at all friendly and certainly is not competitive with other database programs on the market.

Query III's search function allows up to 40 criteria for searching for a given item, but again one-letter codes are used for selecting search conditions and conjunctions. The program provides a lot of functionality in searching but demands work to make it hanous.

Query III lacks a report writer and requires an external text editor to write instructions for formatting a report. The manual suggests that you make the pro-



gram do your bidding by using "your favoire deitor or word processor" to write an appropriate command file that can be accessed by Query III. 1 exited Query III and created an ASCII text file as directed. The program works just as described in the manual, but the effort of programming with single-letter commands doesn't seem worth it no

Query III does include a preformatted mailing-label report format that can be used immediately if you use the prescribed field names and sizes.

While Query III has a rudimentary programming language called Autopro, which can control the program to perform certain repetitive functions, the Autopro program file must also be written outside Query III.

An optional program called Query III Calc includes a calculator and report generator. Query III Calc, which costs an additional \$49.95, offers the editing capabilities necessary for the report writing and program files as well as for adding arith-

metic functions for Query III data fields. In sum, Query III has a nice tone and a few interesting features, but its command structure must be made more friendly if the

program is to meet the needs of many beginning users. The inclusion of a text editor as a standard item would also be a great improvement.—Bruce Brown

REFLEX, THE ANALYST

If you'd like to get statistical information or do financial analysis from your database without transferring the data to your spreadsheet, you'l like Reflex. The Analysis from Bordand Imenational. Reflex of fers functions galore: 4 for financial foresting, 13 for mathematical formulas, 16 for data manipulation, 3 for logical programming, and 13 for special purposes such as setting flags and calculating data from different records. It also has the

speed to get you most results by the time you can say 1...2...3.

If you're thinking of spending a lot of money on a business graphics package that will have trouble importing your data, think abour Reflex instead. With Reflex you can plot any of five chart types—scatter, line box racked bar, stacked bar, and nie—units



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92714-4992 PCM3G+--A1 offer lapers 9:20-86 fields from individual records or summaries of fields from a number of records. You can then dump the chart to a dot matrix printer or plot it with scales, titles, and grids on an HP or Sixshooter plotter in glorious color.

GROUNDBREAKING While its competitors imitate either PFS: File or dBASE III. Reflex is paying new ground. Virtually everything about it is unique for a database program: its interface, its views, and its implementation. As a result, working with Reflex evokes a blend of reactions. Occasionally, you think of the Apple MacIntosh and Microsoft Windows. At other times, you can almost believe you're zipping through a very well-implemented integrated package. Other times, you'll swear you're working with a relational database management system. One thing is sure, if you start using Reflex, it will change the way you visualize and manipulate data.

Reflex's interface includes a menu bar, pull-down and pop-up windows, a 1-2-3like command structure, mouse support, and high-resolution graphics in black and white. You access menu features by hitting the Slash key and either pointing to the fea-

■ By VARYing a *Reflex* record enough times, you create a dummy database that you can then use for simulations, what-if analysis, and forecasting.

ture or entering its first letter. If a feature is unavailable, it is illegible. If you are a command-line fanatic, the interface may grate on you in the beginning. Persevere; it will grow on you after awhile.

You create a database simply by designing a form and entering data. Reflex automatically assigns a field type based on the first character entered into the field and prodefines the field's length. You create calculated fields by entering formulas or functions into the appropriate fields. A formula is signaled by entering an equal sign as the first character in the field. From that point on, you can search, sort, and otherwise manipulate your data.

While most of Reflex's commands are standard features in database programs, VARY is in a class by itself. By VARYing a record enough times, you create a dummy database. You can then use VARYed database for simulations, what-if analysis, and forecasting.

ANOTHER DIMENSION No matter blow you mainpulate data, though, you on will have to view it, and viewing data is where Refler really spartles. Reflex does to databases what film does to storytelling—it adds another dimension. It may be a flat-file manager, but it allows you to view that one flat file from more perspectives than some relational databases allow open files.

As a chabses programs limit be vay you can view the data. You either see the record in solution with a prodefined form a IPSS-File, or you browse through a listing of all the records à la dBASE III. The only other alternative you have is to create a report with breakpoints and calculated fields. In addition to these standards with the control of the

The most unique view is Crosstab. Part spreadheet and part report generator, it enables you to cross tabulate on numeric fields. The view energetizes the data and then summarizes the information in a tubavareages, counts, mass and mins, standard deviation, and variance: You define the catagories by which it breaks down the data. You can specify, for example, a particular value, a marrier range, or a set of conditions. The view displays the summative values, and the numeric range, or

MINOR DRAWBACKS Reflex's drawbacks are trivial when compared with the product's value, but they need to be pointed out. The most obvious is the lack of color support. Another is the lack of a trans-







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parent bridge between the two modules. You should not have to exit into DOS to access a utility, especially a report utility, Reflex lacks the color and the bridge because it was written to take advantage of high-resolution graphics, so RGB monitron need to sit dile. Once we all have fully populated EGA boards, Bortand should add color. And because throw Reflex files are both over 200K bytes, they cannot fit on a single floppy disk. Bortand could, however, implement an install process that that makes them seem as though they were mercod.

By far, though, Reflex's weakest area is the size and the organization of its tutorial and two reference sections. Between the sheer bulk and the chapter-page pagination scheme, finding anything is virtually impossible without the use of a Huffman algorithm. Even if the documentation is pared down, it will still need a rewrite. There is too much nonstandard language. For example, importing a file is found under translating, and copy is copy in the Report view but ditto in the Crosstab view. Even Crosstab sounds more like a new Coca-Cola product than a window for tabulating data. If Borland doesn't redo this manual, someone else will make a mint writing a concise, easily understood manual for Reflex

Despite the lack of color, the need to exit into DOS, and the horrendoss unaual, Reflex, The Analysis is going to become a standard for two reasons. Borland is selling it cheaply enough, and it's more than good enough to the new standard in its class. Reflex will eventually change the market, and for the better. Even if you go on to another database package—and you will if you reade grow—you will want many of Reflex's Gatures.— "Vincent Puglie."

UNI-FILE

When users of Univair Systems' verticalmarket packages for the health care, insurance, and legal professions want to customize their systems, they buy UNI-FILE, Version 5.23. Even if your business doesn't run on one of Univair Systems' ■ UNI-FILE is worth a look if you need a simple list manager that non-technical users can adapt to easily. It will prompt you through each step.

vertical packages, UNI-FILE is worth a look if you need a simple list manager that nontechnical users can adapt to easily. In any case, keep an eye on this program better things are in the offing.

Setting up a data file is a straightforward, menu-driven operation. UNI-FILE supports date, numeric, and string data types. The program will prompt you through each step, including asking whether a field is to be input from the keyboard, calculated based on an existing field, or looked up in another file.

VIRTUAL FIELDS UNI-FILE can also retrieve data from other files for display only; these virtual fields display on the screen like a normal table lookup field, but they are not stored with the record. Although such fields are designed to support data entry, there's no reason you couldn't use this feature to develop a multifile database inquiry application. You could create a file structured to have a single stored field: customer number. Virtual fields would include Last Order, Credit Limit. and Open Balance. When you retrieved a customer's record. UNI-FILE would look up that customer's last order from an open orders file, credit limit from a credit file, and open balance from a receivables file. Since the program would look up these fields each time you retrieved a customer's record, this sort of inquiry would always give you up-to-date information.

But there are a few catches to this exciting possibility. If you organize your files to support multifile inquiries, you may be frustrated when you want a report. Since UNI-FILE's report writer is limited to a single file, you won't be able to duplicate on paper what you can see on the screen. Now that I've thrown water on the fire,





Newcomer Q & A, Version 1.1, uses state-of-the art artificial intelligence and superb overall design to supply the missing link between ease of use and power in flat-file database management systems. It is the clear product of choice in its class. C.I.P. (The Concentric Information Processor) is not the most powerful product in this field, but its "visual" user interface and report generator make it the only database product around that's so much fun to learn and use that you won't want to leave your desk at the end of the day. Alpha/three, Version 1.0, proves that database power and menu-driven flat-file systems can live together quite nicely and with dBASE III compatibility to boot.

keep this in mind: some relational functions are still better than none. Version 5.24 of the program promises to catapult UNI-FILE into PC Magazine Labs Category 2 when it removes this limit by allowing a report to include looked-up fields.

ing a report to include a consecu-up rised. An observable and the consecuration of the consec

sion 5.24. You must specify a key as part of the file definition process, and that key is not only the basis for indexed inquiries into the file from you but also from any lockups originating in other files. A key isn't limited to a single field, however, it can be just the first few characters of a field and include part of as many fields as you'd like, provided that the entire key does not exceed 30 characters. You cannot maintain multiple keys and switch among them to

suit your needs, but you can easily change keys, and nonindexed sequential searches are available to handle the inevitable exceptions.

NO WILDCARD The only element lacking is a wildcard. A search for "Ham" will find "Hamburg" and "Hameling" and "Hameling there's no way to use the substring "ham" to find "Southampton. "If you only want to find "Ham, the program will also locate necords so locate necords so locate necords so locate necords will also just and markets for "Ham "hampsterd" and "Hampst

UNI-FILE's manual contains no information on how to import files, and I got poor results performing the operation on my own. UNI-FILE stores data in a nonstandard fixed format (each record contains a numeric flag field at offset zero and encloses the remainder of the record in quotes). I used the XyWrite word processing program to modify the PC Labs sample files to that format (this type of reformatting requires an editor that can search and replace on carriage returns) and defined a file structure for each with UNI-FILE. While I was able to access the data files with UNI-FILE, the program tossed me out on my ear several times when I attempted to search and reindex the file. Univair says UNI-FILE, Version 5.24, will be able to handle the problem, which supposedly originates from some corruption

to the files UNI-FILE offers a powerful lookup facility, but that power proves to be the exception rather than the rule. (PC Magazine does not review unreleased versions of software, but it's worth noting that Version 5.24, due out by the time you read this, promises to provide substantial improvements.) If UNI-FILE can satisfy your functional needs for a database, you will find the program easy enough for inexperienced persons to operate without extensive training. The written tutorial will likely unhorse its readers as it switches examples midstream, but, augmented with some coaching to explain the pivotal role of keys in searching and table lookups, UNI-FILE's clear design will pull most novices through the learning curve unscathed. -Dick Ridington

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LEARNING AIDS: MANY PATHS TO PROFICIENCY

Video and audio cassettes are among the newest options for helping novices master 1-2-3 quickly. Instructor kits can turn the seasoned user into a tutor.

You tear open Release 2 of 1-2-3. Three books, six disks, four pamphiets, and three miscellaneous inserts spill out onto your already overburdened desk. Your heart takes a swan dive. You don't want to settle down with a lot of reading material. You need to get 1-2-3 up and running—fast. You've got a problem.

and running—text. 10 ve god a proceed Despite 1-2-3's popularity (it's still the best-selling integrated spreadsheet around, nonwithstanding some grumbling that the new release Lotus Development Corp. started shipping about a year ago isn't as improved as it could be), learning the program for the first time is not a task that many would put at the top of their list of firm activities. Although the program is not tough to use once you've mastered the basics, learning how to use it, as with any new software, can be a lonely, frustrating, time-consuming trial.

the continuation of the co

low cost (\$14.95 for one keyboard template) are flooding the market.

To help you make sense of all the available products, I looked at 23 teaching aids in all: 11 on-disk tutorials (4 of them also include books), 5 videotape programs, 3 teaching systems or instructor kits, 1 audiocassette program, I desktop reference, and 2 keyboard templates. Here's how they stack up.

INTERACT ON DISK Tutorials on disk teach you the basic skill you want to master, and they're easy to use and fun to watch (most run in color). Standard startup procedure is to read the installation instructions, load the disk or disks, and press Enter. Then you're off, Just follow the instruction your screen.

All the disk tutorials I reviewed are geared to teaching you 1-2-3; some are designed especially for Release 2, and others will be released in versions for Release 2. All deliver the basics, but some are better than others.

LOTUS'S TUTORIAL When you buy 1-2-3, you get Lotus's own tutorial—at no extra cost. Lotus advises beginners to work through the instructions on the disk, A View of 1-2-3, and the 172-page book that accompanies it. Advanced users can use the disk tutorial alone and skip the

hook

A View of 1-2-3 is not much more than its title suggests. Unlike the other on-disk tutorials I looked at, it does not teach specific skills; it only shows what Release 2 is all about. The tutorial begins by introducing the program's main features, including the worksheet, graphs, and database, and then it briefly explains the functions and the commands. A second section then shows a sample session using a fictitious company to evaluate various business strategies like marketing and budgeting. Here you see many of 1-2-3's analytical skills in action. The third part is devoted to the new features in Release 2: the string functions for text manipulation, the additional financial analysis functions, hidden columns, and the new international formats covering currency, numbers, date. and time. It also covers the new data commands, Matrix, Regression and Parse, and using passwords for security.

The 172-page primed tutorial is written for the 172-page primed tutorial is written for you are new to computers. The six chapters give you the basic—how to build, a tempt you the basic—how to build, a more page to the page of the pag

OTHER ON-DISK TUTORIALS TAC-TICS for Lonus 1-2-3 from the Computer Tutor Corp. and Lotus 1-2-3 Made Easy from QED Information Services are similar to the tutorial packaged with 1-2-3. They're also identical to each other except for the packaging and the price (\$49.95

■ Lotus's own disk tutorial, A View of 1-2-3,

is not much more than its title suggests.

and \$75, respectively). Both include a book and adata disk with files for practice. Both require you to work through the lesson book for create the worksheet and learn the commands. Lesson I familiarize year the commands and lesson a firmiliarize year for the commands. The second for the commands and lesson 3 introduces more commands. The remaining four lessons give good in-depth instruction on all I-23 so other features. But neither of these tutorials is any better than I-23 or on trustrial; it makes little sense to spend on the commands of the commands of the commands. The commands are considered to the commands of the commands

TLS Lones 1-2-3 from TLS Software is one-disk utorial that includes the same subject matter as its competitors, but not with the same depth and not in color. It even fails to teach as well. Since it involves mostly instruction and filter interactions, one your part, any information you learn is hard to retain. Even at the low price of \$49.95, you're better off sticking with Lones's own toroit—for free.





A View of 1-2-3 Lotus Development Corp. 55 Cambridge Pkwy. Cambridge, MA 02142 (617) 577-8500 List Price: \$495 (come

includes: Disk and manual
Requires: 256K RAM, DOS 2.0 or later.
In Short: This is the tutorial that comes with
2-3-3. The disk is a view-only type of lesson,
but the book has a thorough, easy-to-understand-and-follow approach. By creating an
actual worksheet, you learn the ins and outs

of the program. Copy protected. CIRCLE 601 ON READER SERVICE CARD



TACTICS for Lotus
1-2-3
Training Course Parts
One and Two
Computer Tutor Corp.
277 Linden St., #207
Wellesley, MA 02181
(617) 237-1840

List Price: \$29.95 each; \$49.95 the set Includes: One disk for both parts; workbook Requires: 192K RAM for Release 1A:

256K RAM for Release 2.
In Short: This is similar to the tutorial that comes with Louis 3-2-3 in that you must work through the manual to create a work-shoet and learn the commands, it also has a data disk with extra files with which to practice and works with Release 1A and 2. Not copy protected.

CIFCLE 802 ON READER SERVICE CARE



Lotus 1-2-3 Made Easy QED Information Services QED Plaza P.O. Box 181 Wellesley, MA 02181 (617) 237-5656 List Price: \$75

Includes: One disk workbook Requires: 192K RAM for Release 1A; 256K RAM for Release 2. In Short: This is similar to the tutorial that

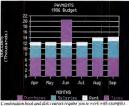
In Short: This is similar to the tutorial that comes with Lotus's 1-2-3 in that you must work through the manual to create a worksheet and learn the commands. It also has a data disk with extra files with which to practice and works with Release 1A and 2. Not

copy protected.

CIPCLE 803 ON READER SERVICE CARE



A View 01 1-2-3 is not a true aisi, intorna occause it snows only some of the aspects of the program. Here it explains the new password feature of Release 2. You can watch 1-2-3 in action, but you are not taught specific tasks. Those are covered in the Tutorial.



Communitation book and aiss courses require you to work write examples from data supplied. By following the instructions from TACTICS for Lotus 1-2-3 and QED's Lotus 1-2-3 Made Easy, you learn to construct stacked bar graphs like the one displayed here.

FILE TLS Lotus 1-2-3 TLS Software Inc. 2005 W. Cypress Creek Rd. Ft. Lauderdale, FL 33309 (305) 771-2100 List Price: \$49.95 Includes: One disk Requires: 128K RAM, DOS 2.0 or later. In Short: A brief course in 1-2-3, this bare ly covers the basics and will not give you a good working knowledge of a complicated program. It does not cover Release 2, and TLS is not considering an upgrade. Copy protected. 604 ON READER SERVICE CARD NDIVIDUAL Training for Lotus 1-2-3 INDIVIDUAL Software Inc gram. 1163-1 Chess Dr

Fouter City, CA 94404 (2003) 31-313-31-61 [List Price: 509.95 Includes: Two disks Requires: 128K RAM, DOS 2.0 or later. In Short: A disk-only program that uses a simulation of 2-3 instead of the real thing. You have the option of learning Release IA 70-2.1 is testly owner through, and you can change the speed to move a little faster. Copy protected.

INDIVIDUAL Training for Lotus 1-2-3 from INDIVIDUAL Software Inc. offers you the option of learning Release 2 or Release IA. A true disk tutorial with two disks and no book, it uses a mock-up of 1-2-3 rather than the real thing. Designed for beginners as well as advanced users, the ten lessons on the disks are easy to run through. The program covers instruction for using the spreadsheet, commands, functions, formats, database, graphics, and macros in a colorful, efficient manner. A warm sense of humor incorporated in the lessons makes the learning process more fun. Also, you can change the speed to go through the lessons faster, and if you don't care to view the current lesson, you can switch to one you prefer. An additional feature that software dealers may find attractive is the demonstration mode that continuously runs highlights of the pro-

SRA of fers another book and disk combour, but in the Lord State. Step by step you read the manual, follow the instructions on the disk, and input data when saked. If you've used 1-2-2 before, you can skip ahead to Esson Sin the handbook and work on practical applications using the files provided. Currently, this thorial, which covers all aspects of 1-2-3, works only with Release 1A, but a version for Release 2 will be available soon. Geared specifically to teaching Release

2. AIT Training Power: Teach Yourself Lotal 3-23 from American Training International Inc. includes two disks, one for novices and the other for more-advanced users. A split screen shows the spreadsheer at the top and the instructions on the bottom, which guide you drumpt the lessons. The exercises that follow the sections allow you to practice skills that were recurrently and the section of the properties of the proper

UNUSUAL TUTORIAL The most unusual tutorial I reviewed is All About Lotus 1-2-3 from JNM Systems, written entirely on 1-2-3 worksheets and for use only while using 1-2-3. What makes All About Lotus 1-2-3 different is that since it was written on worksheets, you can watch 1-2-3 execute macro commands while you are learning. It consists of five disks, four with lessons and the last with worksheet models. Except for the disk with the models, each has five complete lessons and a ten-question test. Currently All About Lotus 1-2-3 works only with Release 1A, but it will be upgraded soon for use with Release 2. Working through this tutorial will unquestionably teach you 1-2-3.

Fast Start Lous 1-2-3 from McGraw-Hill Training Systems is a menu-driven disk tutorial that actually uses 1-2-3. It



you through the commands one at a time. Here it tells you when to make a selection and how to execute a worksheet command. This program uses a simulated worksheet instead of the real thing.

runs in color from two floppy disks and | comes with a 66-page reference manual. As you work through the main menu, the program prompts you to load 1-2-3. Since the worksheet is the cornerstone of 1-2-3, Fast Start cleverly uses drop-down win-

 Most videos are designed to be 1-day courses, perfect for seminar presentations.

dows on top of the worksheet to instruct you. You follow directions and read the explanations as it pulls you through the lessons. If you enter an incorrect selection, Fast Start prompts you for the right response. A nice touch to the tutorial is the checks that appear on the menu to show you what items you've completed. Fast Start covers all the feature of 1-2-3, and it's easy to follow. The only problem was that it froze with Release 2, but it worked well with Release LA McGraw-Hill promises a new version for Release 2 soon

Cdex-Intellisance Corp. offers a couple of tutorials on-disk. Teach Yourself Lotus



windows, Macro instruction for Fast Start Lotus 1-2-3 is in the lower box, If you make the wrong selection, another window is placed on top with a correction. You are then able to proceed with the lesson

> All in all, the advantages outweigh the disadvantages, and video programs can be an excellent way to learn 1-2-3. All the

1-2-3 Program are disk-based learning aids with one teaching disk and one data disk each and a booklet. Although pricey at \$99.95 each, they cover all the basics. These tutorials do not yet reflect the changes in Release 2, but free upgrades will be available soon. The only nuisance was that the beginner's course. Teach Yourself, made so many disk accesses that the disk drive noise began to get to me. Advanced Training is not a continua-

1-2-3 and Advanced Training for Lotus

tion of Teach Yourself, but a refresher course in an entirely new format. Not a mock-up, it works in conjunction with 1-2-3. It's designed for users who are already familiar with 1-2-3, and it's great if you need just a quick brush-up.

WATCH 1-2-3 TV Videocassette-based learning systems can mimic the advantages of usually even-more-expensive classroom instruction. The drawback they share with audiocassettes is that there's no one there to correct your mistakes or to answer your questions. If you didn't get the message the first time, though, you can rewind the tape and watch it again. A flaw of the videocassette approach to learning 1-2-3 is that it can be difficult to read spreadsheets displayed on video monitors. but viewing the identical ones on your PC while you watch the tape partly remedies the problem.



ATI Training Power: Teach Yourself Lotus 1-2-3, Release 2 American Training International Inc. 120.58 Beliffice St. (213) 823-1129

Los Angeles, CA 90066 List Price: \$75 Includes: Two disks Requires: 128K RAM

In Short: A well-planned program that covers all aspects of Release 2. This disk-only course uses a mock-up of the spreadsheet on a split screen. Not copy protected. ORCLE 607 ON READER SERVICE CARE



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All About Lotus 1-2-3
INN Systems
42 Village Dr.
Edison, NJ 08817
(201) 572-3306
List Price: \$79
Includes: Five disks
Requires: 192K RAM

Release 1A; 256K RAM Release 2.

In Short: A thorough disk-only suborial that currently runs on Release 1. A but will soon be available for Release 2. On four disks you get 20 lessons and a review test. Not copy pro-

CIRCLE 606 ON READER SERVICE CARD

McGRIMAT

Fast Start Lotus 1-2-3 McGraw-Hill Training Systems Systems Delmar, CA 92014 (800) 421-0833 ext. 288 (619) 453-5000 List Price: \$79,95

Includes: Two disks, reference masual Requires: 256K RAM, two disk drives, DOS 2.0 or later. In Short: A true disk-based tutorial that actually uses 1-2-3. The colorful, easily understood lessons cover all the asports of Release 1.A. Not yet available for Release 2. Copy

CIRCLE 609 ON READER SERVICE CARD



Teach Yourself Lotus 1-3-3 Advanced Training for the Lotus 1-3-3 Program Cites-Intellisance Copp. 1885 Lundy Ave. Sur Lotus, Ca. VS 131 List Prices: 599.95 each Includes: Two disks each, booket Requiress: 1926 RAM. In Short: This is a good course for beginner, and Advanced Training is excellent

In Short: This is a good course for begi ners, and Advanced Training is excellen for more-experienced users. These highpriced disk tutorials do not yet cover Rolease 2, although a free upgrade will be available soon. Copy protected. CRICLE STOON READER SERVICE CAND videos I reviewed ran at a good pace for beginners, and you can always rewind and look at a lesson again. You can view the lessons by yourself or in a classroom setting with or without an instructor. Most of the products are designed to be I-day courses, making them perfect for a

seminar-type presentation.

The best of the videocassette offerings are from ITT SERVCOM: Intro-

duction to Lotal 1-23 and More About Lotur 1-23 Commands. Each package comes with one tape, one data disk, and four bookles containing a workbook, a quick-reference guide, course-management information, and a command chart suitable for overhead projection. The course management booklet suggests three methods of conducting the training independent study, group serimans, or a selfpendent study, group serimans, or a selfment of the command of the command of the materials and even the classroom, stup, alone with heldful hists for instructors.

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Relative and absolute formulas are an important feature of 1-2-3 taught by all of the programs. Here, Teach Yoursell Lows 1-2-3 uses a dropdown window, over a simulated worksheet, to explain a relative formula. Introduction to Lowe 1-2-3, which has

Introduction to Lotus 1-2-3, which has six lessons, starts with the basics for noncess and goes to incover commands, functions and goes to incover commands, functions are supported to the control of the conference of the control of the control of the consercen, you're instructed to pause, go to the workbook, and practice what you just saw, using files from the data disk. The easy-to-listen-to instructor gives you the conjugation of the control of the control

and the workbook explains any relevant differences.

More About Lotus 1-2-3 Commands picks right up where Introduction to Lotus 1-2-3 leaves off and continues with more on the advanced features of 1-2-3. Experienced users who want to brush up on the more esoteric aspects of the software are the ideal audience for this program. It has seven sessions, covering recalculation and

cell protection.



has a quiz at the end of every section to help you review and test your

knowledge. If you don't know the answer, you can select H for a hint.

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CIRCLE 282 ON READER SERVICE CARD



As with most disk natoriols, ATI Training Power: Teach Yourself Lotus 1-2-3 prompts you for the correct response if you select the wrong command. In this lesson, it is teaching you how to format a range. If you do not make the proper choice, it will tell you to start with "C."

moving ranges, and worksheet status; file commands including Combine, Xtract, Copy, and Erase; 1-2-3's printing features; titles and windows; database capabilities; and commands available only in Release 2. What keeps this course from being perfect is the absence of instruction on graphs

 One clear advantage of audiocassettes is that you can follow the lessons

at your own pace.

and macros. ITT SERVCOM has three more products scheduled for release to remedy the problem, though: More About Lotus 1-2-3 Functions; Macros; and Graphing and Database.

MORE VIDEO COURSES Anderson Soft-Teach also offers two video courses: Lotas 1-2-3 Introduction to the Integrated Spreadsheet and Lotus 1-2-3 Advanced Features. Both are on the short side, running about 40 minutes each. Each comes with one videotage, a data disk with practice files, and a training guide. For independent study, you watch a lesson and follow along in the training guide. At the end of each lesson, you stop the tape and use your PC to practice. Introduction covers getting started, spreadsheet basics. commands, graphics, data management, and macros. Advanced Features continues with the same subjects, but in more depth. Its only drawback is that it's not as complete as it could be. It will give you a working knowledge

won't kam the finer points.

Arhur Young's Johns 1-23 Self-Teaching Video Course from Arthur Young Business Systems, an interactive video Business Systems, an interactive video course compete with two videocassettes, a data disk with 71 files, and an extensive workbook. Designed as a 2-day course, it takes about 14 hours to complete rough man has 18 lessons, including two case studies, and covers everything from the compenents of a microst everything from the compenents of a microst works.

KITS FOR TEACHERS The most orportive way to learn [2-3] is also the best—at your own PC with a capable instructor following a course outline. An organized class led by a trained professional can teach you and your staff quickly and accustely. The teacher can look over your shoulder to correct mistakes as you actually work with the program, unlike with disk or videotaged uttorials. If you have a group of people or an entire department that must be up and running with bly justify the cost of this type of individualized training.

1-2-3 Courseware from Addison-Wesley Publishing Co. is a comprehensive kit made for instructors. The box contains a booklet for cetting started, with surgestions for organizing and running a class. Three instructor's workbooks cover the worksheet and graphics, database and macros. Also included are an overhead master for projection, a data disk, and even name cards and completion certificates. In addition, student modules that include a workbook and a disk are available for



In Short: A rather expensive package

basses. Copy protected.

when you consider the depth of coverage

You can learn 1-2-3 with this, but only the

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Que Corp. makes two instructor's kits for 1-2-3: Using 1-2-3 Instructor's Kit, a beginner's course, and 1-2-3 Macros Instructor's Kit. for more-experienced users of the spreadsheet. The beginner's package comes with Que's book entitled Using 1-2-3, a workbook, two copies of a data disk, and an instructor's guide. Student's kits for this instructor's course are sold for about \$59 cach.



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(800) 524-0425 (201) 493-8031 List Price: \$399 Includes: One disk two videocussettes. workhook

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(workbook with disk), Database (workbook with disk), Macros (workbook with disk) ires: 1-2-3. Release 2. ort. A complete intraction kit on her to teach 1-2-3. It includes all the subject matter and information to organize and lead classes. Not copy protected. CIPCLE 614 ON READER SERVICE CAN

macros course includes 1-2-3 Macro Library from Que, a workbook, a data disk. and an instructor's guide. Student's kits, which cost \$62 include a book.

a workbook, and two copies of a data disk. Both these instructor's guides give complete information on how to prepare a 1-2-3 course from planning to presentation. Each also includes Introduction to Lotus 1-2-3 and More About Lotus 1-2-3 Commands are

ters for overhead projection. The ma-

terials in both courses can help anyone who wants to teach a course on 1-2-3 get started.

using 1-2-3.

LISTEN TO THIS A less-expensive option for learning 1-2-3 is to listen to an audiocassette program. One clear advantage is that you can follow the lessons at your own pace. With earphones, you can work at your PC without disturbing anyone, and no noise interferes with your study. Plus

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transparency mas- the best of the videocassette offerings. After you view the lesson on the video monitor, you practice with the same file from the data disk, actually

you can review the lessons as many times as you wish.

An in-depth course on audiocassettes is available from Flintrack Learning Systems. How to Use Lotus 1-2-3. You simply load 1-2-3, slip on your earphones, and start the lesson. Fliptrack's tape talks you through four training sessions, each running 2 to 3 hours. It takes you through all of 1-2-3's commands, functions, and formats-and, best of all, you can push the



Keyboard templates may not teach you how to use 1-2-3, but they can help reinforce what you've learned. The one on top, from TDA Inc., includes a booklet with commands. The other, from SMA Inc. has the commands written on both sides



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dent kit: workbook, \$29.95; Using 1-2-3, \$19.95; data disk, \$9.95) Includes: Using 1-2-3, Using 1-2-3 Workbook, Using 1-2-3 Workbook Instructor's

Guide, two disks
Requires: 192K RAM, two disk drives,
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In Shortt A kit for teachers who want to lead
classes in 1-2-3. This covers all the subjects
required to teach and complete instructions
on how to get started. Copy protected.

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How to Use Lotus 1-2-3 Fliptrack Learning Systems 999 Main St., #200 Glen Ellyn, IL 60137 (312) 790-1117 List Price: \$89

Includes: Four audiocassettes, lesson summary Requires: Cassette player, Lotus 1-2-3, Release 1A or 2. In Short: An in-depth course that covers all the features of 1-2-3, Re-lease 1A or 2. These

audiocassettes provide over 10 hours of instruction. CROLE 617 ON READER SERVICE CARD rewind button to hear it all again. Optional material is on the flip side of the tape; you simply set the digital counter to 0, turn the tape over, listen to what you want, then rewind to 0 and flip back to the first side. How to Use Lotts 12-3 also includes lessons on the graphics and database features of 12-3.

CRIB ALL YOU CAN Desktop references and keyboard templates can help you make sure you don't forget what you know about using 1-2-3. They're also good crutches and timesavers—better even than the Lonus 1-2-3 Quick Reference manual open to the right page. They save you a search through the manual. And

these aids are easy on your budget. Systems Management Associates' PC Documate is a two-piece plastic template that fits overy our keyboard. Both pieces are labeled with 1-2-3 commands as well keys, and menus. TDA Inc. makes a topoft-the-keyboard template; in addition, if has a small book attached to it, listing all the 1-2-3 commands. Microref Quick Refcence Guide from Educational Systems is described by the command of the comment of the comment of the comment of the comtent of the comment of the comment of the comtent of the comment of the comment of the comtent of the comment of the comment of the comtent of the comment of the comment of the comtent of the comment of the comment of the comtent of the comment of the comment of the comtent of the comment of the comment of the comtent of the comment of the comment of the comtent of the comment of the comment of the comment of the comtent of the comment of the comment of the comment of the comtent of the comment of

MAKING A CHOICE Selecting the most appropriate learning aid may be as difficult as mastering 1-2-3 itself. Before you buy, ask yourself a few questions. Do you require a crash course in basics, a gentle introduction to the program, an intensive seminar in all procedures, or a quick refresher? Do you need another disk tutorial similar to the one that comes with 1-2-3? Do you prefer to use the spreadsheet program while using the learning aid? Is an interactive tutorial best for your needs? Does your budget prohibit investing in an expensive program? Do you have a large group that needs to learn 1-2-3, and if so, would investing in a system designed for instructors be cost-effective? Will more people in your company need to learn 1-2-3 in the future, making a videocassette tutorial that you can play at any time more desirable? Do you have the necessary equipment or required personnel? Do you prefer to work alone or with others?



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In Short: A handy two-piece reference that
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Lotus 1-2-3

MicroRef Quick Reference Guide to Lotus 1-2-3

I-2-3 Educational Systems Inc. 1000 Skokie Blvd. Wilmette, IL 60091 (800) 323-6043

List Price: \$19.95 In Short: A desktop reference that sits next to your PC. It has a colorful index with all the commands and functions. GPGLE \$42 ON PRACES REPROCE CARD

Most people can use all the help they can get when learning a new software program. The cost of your time usually offsets all or most of the expense—as long as what you're buying delivers what you need. A good training aid is one that 's easy to use, progressive, and comprehensive. 1-2-3 has spawned a variety of such training pragms. One or more of them can be your key to unlocking the spreadsbeet's power without boo much can be a contraction of the contraction o

Christopher Barr, A music industry executive, resides in the New York City area.



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Sperry PC/IT, MultiLink' Systems' host computer. The PC/IT was recently quoted by InfoWorld as being "53% faster, offering greater mass storage (44 Megabyte hard disk), and accommodating more users than the IBM PC AT.

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Software Safety Nets for HARD DISK DATA

unning a hard disk

without some kind of a backup system is like playing Russian roulette with a two-shot deringer—either you're safe or you blow it all away. Sure, you say, you'd love

disaster if you're not using a backup system with your hard disk. Is

hard disk. Is there an alternative to costly—and often bulky—tape backup units?

Yes: backup software. you're safe or you blow it all away. Sure, you say, you're safe or you splurge on a tape backup/hard disk unit, but you've already exhausted this year's hardware budget. You feel you have no choice but to risk your data on a hard disk without a backup system.

Not so fast—there is a software alternative for backing up hard disk files. Besides costing considerably less than a hardware/ tape backup system or even a plug-in tape unit (the programs we evaluated range in price from \$39 to \$180), backup software offers two advantages many subsystems lack: flexibility and expandability.

Many of the 11 backup programs we evaluated recognize any legal DOS device, whether it's a floppy disk, hard disk, removable hard disk, RAMdisk, LAN, or a tage backup unit if it is so initialized. Some hardware backup subsystems on the other hand, perform operations only the between the hard flock and the tage. So if you buy a Bernoulli system, for example, you may not be able to transfer the isso you've already backed up to it. The solit ware solution, though, enables you to use a backup program with your current hard disk. Later, when your badged allow you can buy whatever device you want, Inchair me a new min. and Irransfer all your files.

Since DOS supplies backup and restore commands, why clutter your disk with a separate utility? For some users, DOS commands are sufficient. DOS's backup and restore utilities are simple but functional. Because the syntan of BACKUP and RESTORE resembles that of COPY—are major difference is the option—them to the command of the property of the proper

The one feature that DOS's RESTORE

Backup Software: Summary of Features and Performance

compared on features and ability to back up and restore files could not fit on the hard disk with the test file. a 9.77-megabyte (10-million-byte) text file. Program execution was timed from when the last command was entered until control of the computer was regained, including the time for swapping floopy disks (about 4 seconds per swap). Reported below is the number of bytes backed up divided by the time required

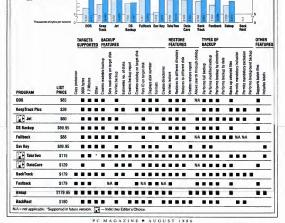
Two of the programs had problems with the test. BackRest

The 11 software backup programs and DOS 3.1 were during operation than was available; the BackTrack program

Fastback uses a proprietary format and automatically reformats floppy disks as part of the backup process; when the test was run using disks already formatted in the Fastback format,

backup time was reduced by more than 100 percent. While Fullback was most efficient at backup and Fastback best at restore, the two results balance out and they're tied on

(bytes per second), and the number of floppies needed. overall efficiency. But ease of use, not speed, was the main cricrashed because it required more storage space on the hard disk teria in selecting the Editor's Choices.



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■ BACKUP SOFTWARE

command contains and many of the programs reviewed here lack is the screen message indicating that system files were restored. (Some programs, like DataCare, will not back up system files.) If the sys- ally friendlier, faster, and more flexible

tem files are restored in a different location, you may not be able to reboot the system from the C: drive.

A dedicated backup program is gener-

than DOS's commands, though, Fastback, for example, can back up a 10-megabyte disk in less than 10 minutes, given ideal circumstances. BackTrack automatically backs up your files while the processor sits idle. KeepTrack Plus performs extended DOS services in addition to backup and restore operations. TakeTwo displays extensive information on its progress while it backs up and restores.

TWO IMPORTANT FEATURES When purchasing a backup program, you should consider two features above all else: reliability and ease of use. If a program backs up your disk in 2 seconds but

cannot restore it properly, money and

time were spent for nought. If the program is difficult to use, it will probably

gather dust. Since time is money, speed or the ability to operate in the background should also rank high on a list of

desirable features. While speed and reli-

ability are measurable, ease of use for

backup software involves a combination

of features such as interface, legibility of

like Fullback and Jet, are strictly com-

mand driven. While they generally re-

A few of the programs reviewed here,

INTRODUCING

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Accidental File ensure is no trivial matter! There are two kinds of users those who have accidentally erased an important file, and those who will!

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Recent surveys have revealed that, on the average, 3.6 persons have access to each computer used in corporate America. It might be four or five days before the victim discovers that their files are oo longer available. When several people use a computer, or a single user operates more than two hours per day, there are two chances that a utility such as Norton's Goerase will recover the missing file(s) - slim and none! It is highly likely that the file's space will have been overwritten in the interim (an impossibility with SafetyNet").

It is our belief that when one has accidentally erased a file their anxiety is bigh - and that's not the time to learn a new technology. With some utility's multi-layered menua, and the admonition that their system doesn't always work, anxiety becomes cear nanic and increases chances for additional operator error causing loss of the vital information forever!

SafetyNet's requires the user to do three things: 1) Type "SN" at the > prompt, 2) Mark the files presented on the screen, 3) Press the Enter Key. That's it! No need to know about sectors, clusters, bits or bytes. No requirement to replace the first letter of each previously erased file - a simple, foolproof manner to end the panic which comes when files are accidentally erased.

SafetyNet™ works first time, every time. Regardless of the time span between the actual crasure and discovery, there is oo danger that the allocated file apage will be overwritten, thus rendering the recovery doubtful or impossible. with a no nonsense user interface.

 A dedicated backup program is generally friendlier, faster,

backups, and help.

and more flexible than DOS's backup

commands.

quire less overhead and are usually flexible and powerful, their main drawback is that they lack help screens and other fringe benefits like automatic formatting and an estimate of the number of floppy disks needed. On the plus side, they begin processing the instant you issue the command. Menu-driven programs, on the other hand, generally require you to answer endless prompts before they tell

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DON'T BOOT UP WITHOUT US

CIRCLE 153 ON READER SERVICE CARD

you to "Please Insert a Diskette in Drive A:." Some programs, like Bakup, DS Backup, and DataCare, offer both interfaces as well as support for batch files.

The programs vary in the amount of information they supply on-screen. BackRest, which produces error reports that you can print, displays only the number of the disk it just completed backing

 Bakup, DS Backup. and DataCare offer both command- and menudriven interfaces as well

up. TakeTwo gives you the estimated and actual time for the backup or restore; the names, number, and location of files being backed up; and the percentage completed. Many programs also include reporting features. The most rudimentary form is simply a listing of which files were backed up to which volumes. Others, however, include such statistical information as the number of files and

as support for batch files.

While the vast majority of backup programs produce backed-up files that are readable and executable, the directories are not always the same as those on the hard disk. TakeTwo, for example, groups files into directories such as

bytes in each directory.

"TT MAR15.010," and Bakup uses a code based on the backup sequence. As a result, knowing which file is in which directory without first looking at a report or a catalog can be difficult. Of course, such schemes are far more reasonable than that used by Fastback, whose disks even The Norton Utilities won't read.

Other features some backup programs offer include protecting backed-up files from accidental erasure by setting the read-only attribute, requiring confirmation before overwriting files, and providing sequenced labels for floppy disks. While none of these features is absolutely necessary, they add to a program's appeal.

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PROBLEMS? NOT TOO SERIOUS Although a number of programs indicate that IBM's DMA (direct memory access) chip may present problems, only one— DataCare—points out and explicitly cor-

rects an undesirable side effect of DOS's RENAME command. When you RE-NAME a file, say from OLD.TXT to NEW.TXT, DOS does not set the archive bit. If you should then create a new file

DS BACKUF

with the name OLD.TXT, a modified backup will back up the new file as OLD.TXT and exclude the old file NEW.TXT from the backup. As a result, you no longer have a valid copy of the orieinal backup.

Surprisingly, only two programs reviewed here altered the AUTOEKEC-BAT files. BackTrack was justified in doing so, since it was designed to run in background. Sar Key, on the other hand, renames your original batch file and then writes a new one that includes only the date, the time, and a command to execute Sar Key.

A more serious problem is copy protection. Fastback, Bakup, and BackTrack are

■ Fastback uses the keydisk approach to copy protection; others use the install/uninstall theory. But who's kidding whom? Any copy program can break the protection.

copy protected (TakeTwo used to be copy protected but no longer is, and Tallgrass has announced that BackTrack won't be as of July 1). Fastback uses the key-disk approach: the others follow the install/uninstall theory. But who's kidding whorn? Any copy program (such as Copy2PC and Copy Write) can break the protection. In fact, for one of the above-mentioned programs, you don't even need a nibbler. If. during the uninstall process, you should happen to hit Ctrl-C just after the program increments the system disk and before it wipes itself off the hard disk, you end up with a full complement of installs on the system disk and a working copy of the program on the hard disk. That single extra install may be the difference between restoring your files and waiting by the mailbox for a replacement disk should the program

go south three times.

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Design Software, 1275 W. Roosevelt Rd., West Chicago, IL 60185

KeepTrack Plus

The Finot Group's KeepTrack Plus differs from the rest of the programs reviewed here in that it is actually an extended DOS services program (for a discussion of its other capabilities, see "Extending DOS's Capabilities," PC Magazine, Volume 5 Number 9). You can therefore perform your hard disk housekeeping and never get to see that enigmatic DOS line. Best of all. KeepTrack Plus does it all without sacrificing necessary backup and restore capabilities. While KeepTrack Plus may not boast as many bells and whistles as other programs, it is speedy, reliable, easy to

run, and very inexpensive. One of the program's stronger features is its flexibility in file selection. In addition to recognizing wildcards, the program lets you scroll through the directories and tag the files you wish to back up. While this process may sound tedious, KeepTrack Plus's graphic tree actually makes it sim-

ple and quick. Some of KeepTrack Plus's features are not as elegant as they might have been had the program been completely dedicated to backup. To get an estimate of the number of floppy disks needed, for example, you need to check the program's status window and then hunt through the wealth of information about your system to find what you want. If you want the files to be verified, you must set DOS's verify option





Version 1.83 The Finot Group 2390 El Camino Real, #3 Palo Alto, CA 94306 (800) 628-2828, ext. 700

(4t5) 322-6t6t List Price: \$39 plus \$5 handline Requires: 256K RAM, hard disk drive, floppy disk drive.

In Short: A speedy, reliable pros apart by its origins in extended DOS services, KeepTrack Plus is easy to run and inexpensive but best for a personal, not corporate,

setting. Not copy protected.

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■ BACKUP SOFTWARE

before running the program.

If you are looking for a standard program to back up your personal PC or XT. KeepTrack Plus is probably the best value for the money. But it doesn't really offer enough features for the kind and volume of backup often required in a corporate envimonment.

.Jet

Jet is the command-driven transfer utility that comes with Tall Tree Systems' popular Jetdrive, a RAMdisk program. Although Jet is not a backup program in the

. Jet offers what most users look for in a backup program: flexibility. reliability, and an easily learned syntax.

usual sense, its flexibility, reliability, and available options have made it the backup method of choice of many Jetdrive users.

Besides the usual options for backing up by date, archive bit, and subdirectory, Jet has a number of unique settings. Two of these, exception and mandatory, come in very handy when you perform regularly scheduled backups. Other useful options include copying only those files that appear on the target floppy and transferring non-DOS zero-length files. The former option allows you to update backups. Jet also enables you to create a list of files that need to be transferred en masse. That option was a real timesaver when I was transporting all the individual files for this article back and forth to and from PC Magazine Labs.

Let does have one minor flaw, when restoring files you press Enter to continue a restore and the space bar to kill the operation. Because the space bar is so large, you can hit it quite easily when you don't intend to

Jetdrive, the main program on the disk, creates up to four RAMdisks. While you



Jet, Version 3.3 Tall Tree Systems JETORIVE

1120 San Antonio Rd. Palo Alto, CA 94303 (415) 964-1980 I ist Price: \$60 Requires: 128K RAM, two floppy disk drives.

In Short: A command-driven transfer utility that comes with the Jetdrive RAMdisk. Jet offers flexibility, reliability, and unique backup options. Not copy protected.



DS Backun Version 2.4c Design Software 2 N. 520 Prince Crossing Rd., #16 West Chicago, IL 60185

List Price: \$69.95 Requires: 128K RAM, DOS 2.0 or later. In Short: Design Software's DS Barkun is an acceptable, reasonably priced backup and restore program that unfortunately may force you to relearn some basic concepts. Not copy protected.

can create a RAMdisk with most memory boards, you need a J-RAM board to access its full capabilities. Jetdrive's greatest feature, though, may be its ability to survive a warm reboot.

Jet offers what most users look for in a backup program: flexibility, reliability, and an easily learned syntax.

DS Backup

Design Software's DS Backup includes most of the standard options, such as backing up by directory, file, and archive bit. It also offers both menu and command-line interfaces. In spite of (or maybe because of) its menu interface, DS Backup has certain idiosyncrasies, however, that make it a little harder to use than other programs.

DS Backup's menu selections are not always intuitive; that is, they do not always reflect what you think they should. The most distressing example is the way the program labels the source and the destination. In all other programs the source is where a file resides, and the destination is where it is going. While this is true for the

backup operation in DS Backup, the oppo- | that fact does not forgive the mislabeling. site is the case during a restore: then, counterintuitively, the source is the hard disk, and the destination is the floppy disk. The screen does point out this aberration, but

While DS Backup produces readable backups, it saves all the files within a file named DISK_NO.* where "*" is a number. Each file is coded at the front of its

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■ BACKUP SOFTWARE

data. DS Backup keeps the directory and catalog information in a separate file on the last disk of the backup session.

DS Backup also suffers from a crowded manual that has little white space and illustrations that are too small. The program is worth its \$69.95 price, but you can find better backup programs on the market.

Fullback

Alps Software's Fullback consists of four program files in one package: Fullback. DIRimage, CTLback, and Bigback. Fullback backs up files that can fit on one floppy diskette. DIRimage creates the subdirectories. CTL back creates a control file for excluding files or directories, including specific files, and setting the destination target's root directory. Bigback handles the files that must be split. While Fullback's lack of a unified front end prevents you from backing up a hard disk in one fell swoop, the individual programs them-



(303) 687-1442 List Price: \$88 Requires: 128K RAM, two florery disk drives.

In Short: Actually a transfer utility consist ing of four separate program files, Fullback offers command-line operation, powerful

user-selected options, and low overhead, but it's not for those suffering from DOS-phobia.

Business Pro P.O. Box 44075 Phoenix, AZ 85064 (602) 996-6547 List Price: \$89.95 Requires: 64K RAM, hard disk drive, floppy disk drive, RESTORE COM and BACKUP-

Sav Key, Version 2.1

In Short: An inelegant front end for DOS's backup and restore programs, Sav Key involves more processing time and a lot of disk

swapping. Not copy protected.

selves are extremely useful and powerful. Because Fullback is actually a transfer utility, you perform a restore by reversing the drive letters on the command line. Fullback C: A:, for example, indicates a backup, while Fullback A: C: implies a restore. Bigback performs a restore function with a switch setting. Other switches allow you to back up by date, set the archive bit, leave it unchanged, and turn it off.

The DIRimage program displays your directories along with the number of bytes

 Because Fullback is actually a transfer utility. you perform a restore by reversing the drive letters on the command line.

their files occupy. You simply select the directories you want to back up and have DIRimage create them on the target disk. While the process is almost immediate and extremely easy, the program does not prevent you from creating more directories than a disk can hold once the files are transferred into them.

Despite the simplicity of its commands. Alps Software's Fullback package is not for you if you have a tendency to suffer from DOS-phobia.

Sav Kev

If Sav Kev works as advertised, it has more to do with DOS than with Business Pro. the creators of this front end to DOS's BACKUP, RESTORE, and FORMAT programs. Even before installation, the program insists you copy the DOS programs to the root directory. Then, it needlessly and inconsiderately changes your AUTOEXEC BAT

After running the PC Magazine Labs tests, I renamed three text files to the appropriate DOS program names and reinstalled the Sav Key program. It installed without a hitch and then crashed when it tried to do a full backup. When I called it 1 "completed" backups were listed. back, its "catalog" showed the backup as completed. I tried a daily backup; all the appropriate messages appeared, and the system froze. When I rebooted, both

Other than giving you a menu interface and a report feature, Sav Key adds very little to DOS's programs. For example, to learn the number of floppy disks you need,

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SYSTEM SUPPORTS ALL POPULAR SOFTWARE SUCH AS WORDSTAR, DBASEIII, LOTUS 123, MULTIMATE, ETC. you must consult the manual. What Sav Key does add, however, is more processing time and dependency on Business Pro's system. To restore any files, you must first insert the system disk, then the

first backup disk, the system disk again. and once more the backup. The disk swapping is necessary because Business Pro copies RESTORE.COM off the backup

If none of the above offends you, consider this; Sav Key's menu includes an "End of Day" option consisting of an onscreen message that tells you to turn off your computer. You can use batch files to create a more efficient and friendlier front end than the one Business Pro created in Say Key, Version 2, I-and you can charge \$89.95 for it.

DataCare

Ellicott Software's DataCare uses both menu and command-line interfaces to give you a backup at least as reliable as that of DOS-and with better-than-average speed. For restoration, DataCare uses DOS's RESTORE and VERIFY programs. The menu interface is concise, intuitive, and a pleasure to use. The command-line interface includes six switches for including subdirectories, appending files to a previously backed-up floppy disk, printing the index, backing up by



DOS 2.0 or later.

In Short: This reliable, faster-than-average backup program uses both menu and command-line interfaces and offers three very eful utilities. Not copy protected. CIRCLE 647 ON READER SER



TakeTwo Version 1.04 United Software Security 8133 Leesburg Pike, #800 Vienna, VA 22180

(800) 892-0007 List Price: \$165; copy-protected version \$115

Requires: 128K RAM, hard disk drive, floppy disk drive.

In Short: The best all-around menu-driven backup program reviewed here, TakeTwo offers informative screens, speed, and a variety of options. Optional copy protection.



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date and archive bit, and suppressing the

ceed this you can run DanaCare without reading the manual, you should read reading the manual, you should read to learn what the three utilities included on the disk do. D. COM, which displays an enhanced directory laten, has optional switches for seeing hidden and system whiches for seeing hidden and system floopy disks needed for backup, and totals pace. CMP. COM compares two files anywhere on the disk. R. COM renames files and reach the arbive bits of that the total reaches the arbive bits of the total reaches are to the total reaches are the total reaches are to the total reaches are the total reaches are to the total

■ While you can run DataCare without reading the manual, you should read it to learn what

the three utilities included on the disk do.

files and entire subtrees.

If you have been using DOS's BACK-UP and RESTORE and would like some added features and speed during the backup process, DataCar is well worth the investment. If you don't already have a program that renames directories and performs moves, DataCar would be an invaluable addition to your software library.

TakeTwo

After neceiving one too many customer compalaints about incompatibilities and serubbed installs, United Software Security (USS) removed the copy protection from TukeTwo. I'm very pleased, not only with this recent turn of events but also with the backup program itself. An extensely say-to-use propara, TukeTwo includes informative screens and reports and offers a variety of backup options. (If you belong to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to the Don't You-Dure-Use-My-Program-on-Another-Mathine school, you can be considered to th



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■ BACKUP SOFTWARE

buy a copy-protected version.)

The first thing you notice when using the program to back up your data is TakeTwo's screen. It lists the number of files, number of bytes, and number of filespies—indicating not only what must be backed up, but also the progress and the percentage completed. Also displayed are the volume name and the rate (in kilobytes) at which it is transferring data. The restore screen is similar. Such information may not be necessary, but it is ressuring.

When backing up, TakeTwo writes a volume label on the target, codes the directory names with the date of the backup, and sets the DOS-compatible files as readonly. When restoring files, it prompts you

 Easy-to-use TakeTwo includes informative screens and reports and offers a variety of backup options.

for the destination and the filename. This prompt gives you a chance to restore the file either to a different drive or directory or to the original one but with a different name. Because TakeTrwo does not back up DoS's hidden system files, you cannot mistakenly overwrite the ones on the disk and thereby create a nonbootable hard disk.

The catalog on the hard disk is the basis for TakeTwo's history report. The report, which is as extensive as the backup and restore display screens, tells you virtually everything you'd like to know.

TakeTwo seems to take an inordinate amount of time to back up small files. It spends most of the time writing catalogs and indexes to both the flooppy and the hard disk. When it came to the 10-megabyte test file, though, only Fastback and the command-line-driven transfer programs were quicker.

According to a USS company spokeswoman, future enhancements for Take-Two include support for color and other

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■ BACKUP SOFTWARE

target media such as tape subsystems.

If you need a history of backups and restores, prefer or need menus, still want control over your files, and aren't willing to give up speed for all that power, get USS's TakeTwo. Then just put up your feet, take a 2-minute break, and let Take-Two do the rest.

BackTrack

Tallgras Software Technologies' Bact-Texe is unique in that you can set in the operate in the background. You must, however, keep the BackTrack disk in your loppy disk drive. If you have only one loppy disk drive, the processing can become annoying, ospecially when you need the drive for an application. You must first suspend BackTrack, swap floppies, use the other application, reswap floppies, and then ressume BackTrack.

On dual-floppy systems, though, Back-Track works like a charm. While accessing the target drive, it puts a smiling face in the upper-right-hand comer of the screen. BackTrack alters your AUTOEXEC BAT by anoending commands at both the

beginning and the end. It doesn't change your CONFIG.SYS, but it does reset the buffers at 88 while operating at high speed. The program allows different configurations and times for backup operations.

You can back up to one of Tailgrass's tape units or a mainframe virtual disk. In addition to inclusion and exclusion of files,





List Price S129
Requires: 256K RAM, hard disk drive,
floopy or additional hard disk drive.
In Short: BackTrack processes in the background and allows different configurations
and times for backup operations, but it tends
to be space hungry. Copy proceeded for all
versions made price to July 1.

GRICE MAGGINERSPINGE CAPO.

BackTrack can back up or restore when

BackTrack can restore floppy disks out of sequence. While this capability may be a boon in certain circumstances, it definitely causes moblems with solit files.

Tallgrass has promised to eliminate is: copy protection scheme as of July 1 (cur-ently a backup disk is sent to you when you registers. But Backtrack has two other problems with its installation. If your hard disk is nearly full, Backtrack installs partially and then crashes when run. (This initiation prevented us from running the PC Migazine Labs 10-megabyte test file. John, if we substituted a 5-megabyte test file. John, if a substituted is form running the control of the file. Also, if a substituted is form running the control of the file. Also, if a substituted is form running the control of the file. Also, if a substituted is form the control of the file. Also, if the file of the control of the file. Also, if the file of the control of the file. Also, if the file of the control of the file. Also, if the file of the control of the file. Also, if the file of the control of the file. Also, if the file of the file of the file of the file.

Although it can sometimes be annoying, BackTrack can handle all your backup work—as long as you have the room to spare on your hard disk.

Fastback

Running Fifth Generation Systems' Fastback must be a lot like being a jockey on the lead horse in the Derby. You may not hear the roar of the crowd, but you can almost feel the wind as your arms swing from side to side slapping one floppy disk after another into the drive. Fastback is the program the rest are running after. And to a point, you cannot blame them. A 10-minute backup is enough to make anyone think of thoroughbreds. Unfortunately, Fastback is also as temperamental as a thoroughbred. (For example, Fastback backs up to floppies only-and it has compatibility problems with many of the mail-order IBM clones.)

Before it completes its installation, Fastback, Which requires a key disk for operation, needs to check and pass your drives—drives are rejected on the basis of rotational speed—and the DMA chip on the controller! I you have a defective chip, Fastback sets itself at a slower speed (are higher than the controller! I you have a defective chip, Fastback sets itself at a slower speed (are higher than the controller! I you have a defective chip. Fastback sets itself at a lower speed (are higher than the controller). If you the past of the past o



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Requires: 128K RAM, hard disk drive. floppy disk drive In Short: Fast but temperamental. Fastback offers batch file support with some handy op tions, but it backs up to floopies only and

plays a pass/full game with hardware. Copy

chip, the problem may really lie in the drive Fastback passed, since the program uses the drive to test the chip.

Some of Fastback's speed comes from running the drives constantly. You insert and remove floppies while the drive is still spinning and the red light is on. Fastback checks the drive door to find out when you've inserted a floppy disk. This eliminates the time needed for the drive to rev up to speed with each disk swap.

The backup and restore menus are essentially the same, the main difference being the options available. Batch file support includes three options: include subdirectories, include modified files only, and verify after write. If Fastback finds an error while the verify switch is set-and it usually does-it kills the entire backup or restore.

If you are averse to key disks, Fifth Generation will supply a two-time install/uninstall version of Fastback for an additional \$25. All in all, I'd rather use a slower program that lets me back up to any device, doesn't play pass/fail with my hardware (which other programs find acceptable), and produces a backup that other programs can manipulate.

Bakup

No one can say that the developers at Software Integration didn't try to make Bakup a friendly program. Bakup offers both a menu and a command-line interface, sup-



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through applications, it slows down drags its feet and makes you want to

scream. Don't scream...get The SC yest timesaver from Microsync "... The SCREAMER breaks old PC speed limits by doubling the speed of your IBM FIG. AT or compatible, which means you go faster word processing, speeder ground sheets, doubtle-fime data beget safe may processing, speeder ground sheets, doubtle-fime data beget and much more. All aspeeds of your PC operations are speeded-up, including I/O, memory access and disk access. The SCREAMER has an on-board battery backed-up clock-calendar. Keyboard selectable speed control, fits in a short expansion slot and is

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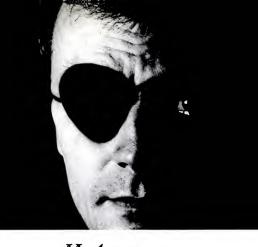
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of the music to politicians to social postions, carries over into our perception of software.

That's one of the reasons software pullishers benome what they like to call "the bottleneck at retail" hi's tough to get a new program in an established category onto the market; nearly impossible to get a new kind of program on the shelves. Because sheep-like, we follow the same

ruts across the pasture to the old, familiar staff.

That preference for sorting programs out into too few and unsully ill-defined cangories has meant we've seen a slew of other very different utilities homeed together into

ries has meant we've seen a slew of often very different utilities ismped together into the "disk manager" and "DOS command shelf" slots.

The market's perception (or misperception) of a program's natural babitat leads to

Jone: but market-teaming competences to Jim Seymour writes the syndicated news paper column, thereoffusivess," and help corporate colents keep sheer microcompute users happy. whom they're only distantly related

perfect example of such a science—a power tool for better than anything like it on the market, but one which suffered from being second (or maybe fifth or eighth) of its land to market. On the surface it looks like a DOS command whell; to precise, it's a sophisticated disk manager, a nearly indipensable tool for hard-disk tense. Southwish I did was the first "disk mansouthwish I did was the first" disk mansouthwish. I like this suffere from a servision street, like this suffere from a servi-

much any more. By contrast, PethAineder is so fast, convenient and useful that I use it constantly, and can no longer imagine trying to run a large-capacity hard disk without it. The program uses windows for last of directotion of the contrast of the

Because it's memory-resident, Pask-Mindro runs lightning fast, because it follows the DOS rules, it runs with almost anything you can pet on a disk. The program is full of the roughes. A joing good screen oriented editor lies youclean un. BATs and add new flourness.

to your AUTOEXEC and CONFIG file without baving to boot up your fuvent plain-ASCII word processor or COPY CONvinse.

erming capathitins of PathMinder are alone worth the price. You can erase groups of files, or move groups of files from any directory, on any dak, to any other without playing Wildcard Roulette. An encryption routine scrambles data very ricely. An applications—mean generaciety was the PathMinder from the casual suer, while delivering its power.

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■ BACKUP SOFTWARE

ports batch files, and creates extremely useful backup and restore reports. Among its other features, Bakup estimates the number of floppy disks and the time needed to process a backup, and it displays the current progress. Bakup sets the read-only attribute on backed-up files to prevent accidental erasure. The program is even packaged with numbered labels for your floppy disks. While Rakun's operations are extreme-

ly easy and reliable (its speed, though it is not blinding, is certainly respectable), it has a number of minor drawbacks. First the program uses an install/uninstall copyprotection scheme. Also, it labels the directories it creates as BKP00010.002, fails to tell you which out-of-sequence floppy disk you may have just put in the drive. and allows an ill-aimed keystroke to change the destination disk during a restore process after you saved the proper configuration. On top of that, Bakup's catalogs are hidden files; you may begin to wonder exactly what Software Integration is protecting. I like Bakup, I don't like the copy pro-

tection, the hidden files, and the cryptic directory names.

DITOR CHOICE

If you don't want to be bothered learning commands or remembering when to perform a backup, United Software Security's TakeTwo should be your choice. Its automatic and user-scheduled backups, informative screens, and report features make it easy to learn and convenient to operate. If you are averse to menus and would like more control over your options and target media, Tall Tree's Jet flies like no other. Besides, you also get the Jetdrive RAMdisk for the same price. If you would like the best of both worlds, menus and commandline processing. Ellicott Software's DataCare does the job. It may use DOS's RESTORE.COM, but it also replaces DOS's DIR, REN, and

COMP commands.

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BackRest

BackRest may be flexible, but it is also one of the slowest and least-friendly programs reviewed here. Its flexibility, rate of

speed, and interface are all related, the common thread being three letters; CP/M.

BackRest's flexibility lies in what it calls control files. Because each file enables you to specify paths and files, you can customize your backup and restore operations. You can exclude files either by declaring them exceptions or by excluding the path the file lies in from the control file. You create a control file either with an editor or with the installation program.

Because you must tell BackRest your paths, you do a lot of entering by hand; a utility that automatically finds and then pops them into the control file after a confirmation is much needed.

BackRest failed to back up PC Labs' 10-megabyte test file after 4 hours and 40 floppies' worth of trying. The error report showed trouble while verifying the backups. BackRest took another 2 hours to restore 28 of those floppies before it crashed because of lack of room for its report file.

BackRest's tortoiselike speed and unfriendly installation overshadow any of its benefits. I recommend BackRess only if you want to devote a good part of your life to using it.

Vincent Puglia is a frequent contributor to PC Magazine



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CIPICLE 643 ON READER SERVICE CARD

Requires: 128K RAM, hard disk drive, floppy disk drive. In Short: Bakap is a friendly, easy-to-use, and reliable backup program with some minor drawbacks-most notably copy protec-BackRest.



Version 2.1 17 W. 17th St New York, NY 10011 (212) 243-1444 List Price: \$180 Requires: 128K RAM.

hard disk drive, floppy disk drive. In Short: BackRest, an extremely flexible backup and restore program, suffers from its slow speed and unfriendly interface. Not

copy protected. CIRCLE 642 ON READER SERVICE CARD

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PC MAGAZINE AUGUST 1986



PRODUCTIVITY

■ PC LAB NOTES: DESKTOP ORGANIZERS ■ WINN L. ROSCH

GIVE YOUR PC ADDED UTILITY

Short batch files and programs using DOS and BASIC let your PC function as a notepad and calculator, find and dial phone numbers, and set up your printer's features.

any of the capabilities that desktop utility programs normally beit on a rudimentary level. Without much work you can write short batch files or programs, using only DOS and the BASIC language that you already have, to take advantage of your PC's hidden powers for quick note-taking, calculating, finding prone numbers, and dialing.

These quick, home-brew utilities won! roul the commercial products in power. Because they lack RAM residence, you can (call them up from within amother product and the many can be commercially the program requires some expension assembly language because you must load the program into memory, reserve the memory to the program, and revector interrupts in order to entire the program from the program from the program from a second program and the program from a second program and the program from a second program from the program from the

THE INSTANT NOTEBOOK The noncheok is probably the most populably the most populably the most populably the most populable add-on utility, useful whenever you need to write a quick note and don't want to to their loading a word processor, selecting all the defaults. Making a notebook out of your PC is easy because you can let DOS do all the work you need to do is copy what you type at the they you can read, review, or edit when you get a chance as a chance.

Moving the characters that you type into a file requires only a single command using the internal DOS function COPY. The only difference between using COPY to duplicate files and to take notes is that you must tell DOS to copy from the keyboard instead of from a file. DOS calls the combination of keyboard and monitor CON (for CONsole), so the command to copy that you type to a file, called FILE-NAME in this example, would be as follows:

COPY CON FILENAME

DOS will let you type as much as you want—up to the limit of the space available on your destination disk. Then, when you are through entering text, you must tell DOS you're done by typing an "end-of-

PRODUCTIVITY INDEX

PC LAB NOTES
Use DOS to dial, set up a printer, do math, and take notes.
PROGRAMMING/UTILITIES
Programs to explore EGA modes, video pages, colors, palettes, and borders

SPREADSHEET CLINIC 1-2-3 tips, a novel use of @ NA, and a 2.0 bug fix POWER USER

Crosstalk colors, WordStar borders, and Word Perfect envelopes USER-TO-USER Call-Waiting Zapper, PAUSE refinements, BASIC debugging tips

PC TUTOR Learn about the V20 chip, printer form-feeds, and date sorting. file" character. Ctrt-Z or ASCII 26. Do this at the end of your note by starting a new line, pressing F6 for Ctrl and Z at the same time), then pressing Enter. Your typing will immediately be copied to disk. You can later use the DOS TYPE command to review it or cdl the text using your normal editor or word processor.

DOS automatically crases whatever old FILENAME existed before creating the new one, so the simple instruction won't let you add notes to an existing file. However, you can easily modify the command to do that by telling DOS to append your new typing to an existing file. The following command line does exactly that, concatenating what you type at the keyboard to the end of the file called FILENAME, calling the new file by the dol file's name:

COPY FILENAME+CON FILENAME

Note that DOS will echo each file or device name on your display as it starts to copy to disk, but the screen appearances of these names will not find their way into the final file you create. If FILENAME does not exist when you first use this command, don't worry. DOS will create it as it goes along.

You'll probably want to put this simple instruction into a batch file to make it even easier to use. I recommend a file called LOG.BAT, so you can keep a running log of your notes. To create such a batch file, type in the following (hitting the Enter key at the end of each line).

COPY CON LOG.BAT (Enter) COPY LOG.DOC+CON LOG.DOC (Enter) "Z (or P6)(Enter)

■ PC LAB NOTES

and DOS will respond with "I File(s) Copied."

This method of taking notes does have its shortcomings. You'll miss the little extras that word processors give you, like word wrap, and you'll probably find that editing is somewhat limited-specifically, to the backspace key.

QUICK-AND-DIRTY DIRECTORY

You can turn your PC into an on-line telephone directory by using the DOS FIND command (in DOS 2.0 or later). Unlike COPY, which is always available when DOS is running, the program FIND EXE (included on your DOS disk) must be located in the current directory or within the search path specified by your most recent PATH command for this feature to work properly.

The FIND program reads characters from files and compares them with a string that is input to the command. If it finds a match, it echoes the entire line containing the target string to the screen. Thus, if you store in a disk file a fist of individuals' names, company affiliations, telephone numbers, and a short note or nickname for each one-each complete entry on its own tine-you can use FIND to search the file and display the entire line of information about an individual when a match is found with any part of an entry

In my telephone storage system (which I still use despite having SideKick on-line). I call this batch file #.BAT. The telephone directory I use with it lists each individual's name first, followed by his telephone number, his company affiliation, and another key word or two-a nickname or a product. That way I can use it as a quickand-dirty database that allows me to find the names and numbers of people and products with a few keystrokes directly from the DOS prompt. For instance, if I want to find listings for all the makers of hard disks to do research for a story. I just type

Winchester

and a dozen names and numbers pop up on the screen To make the FIND command into an easy-to-use telephone directory, you need to create two files-the directory itself, in which one line is devoted to each entry, and a short batch file, which consists of exactly one line. Assuming a telephone directory called PHONE.NOS on your hard disk, drive C:, the contents of the entire batch file would be as follows:

FIND "%1" C: PHONE, NOS

To eneute this butch file and call it #.BAT, type the following at the DOS prompt: COPY CON #.BAT <Enter>

FIND "%1" C:PHONE.NOS (Enter) Z (or F6) (Enter> When you use this batch file, DOS substitutes the name you input after the batch file name for the %1 in the command, then searches the file PHONE. NOS for a

 You can turn your PC into an on-line telephone directory by using the DOS FIND command included with DOS 2.0 or later.

match, and echos each hit to the screen. Of course, since every match is echoed to the screen, when you look for Bill, you'll find every Bill you know or owe.

You can build the file PHONE.NOS using your text editor (providing it is capable of creating standard ASCII files) or the DOS COPY command, as shown for the log file above. Note that FIND is case sensitive, so if you type

Paul

it won't find a name entered as PAUL. Moreover, it will find words embedded in other words, vanking RON from ELEC-TRONICS but not Roy from Electronics.

DIALING FOR MISERS Once the numbers are displayed, I use SideKick's

auto-dialer to pull a particular number off the screen and dial it. If you don't have SideKick or another

COPY CON DIAL, BAT MODE COM1:1288 ECHO ATDT %1 %2 %3 %4 %5 >COM1: PAUSE ECHO ATH > COM1:

Figure 1: A quick way to dial from the DOS prompt. You type DIAL and the number you want. The parameters (%1, %2, etc.) are replaced with the phone number. You need several because DOS treats anything set off by a space as a separate parameter, 9, 1212 5551212 would be the first four; the fifth would be ignored.

program with a built-in dialer, you can make your own phone dialer with a batch file (your own will require you to retype the phone numbers-it won't read and dial them from the screen, as SideKick does). In the April 29 PC Lab Notes (Volume 5 Number 8), M. David Stone outlined several quick schemes to take advantage of the auto-dialing capabilities in your modem.

The tricks involved are simple. First you must set up the communications port to which your modem is connected (using DOS's MODE command) so that the modem will understand the codes sent to it. Then you must echo the proper dialing instructions to the modern port.

In Figure 1, this procedure is refined by adding a pause command, which makes your PC wait until you press a key, then a command to make the modern hang up, so you don't have to share the phone fine with it. This file assumes you have a Havescompatible modem.

See Stone's earlier article for more refinements and details about customizing this utility for your needs.

OUICK CALCULATIONS In the long years before SideKick, I used my PC as a desktop calculator by dropping into BA-SIC and using its immediate mode for calculations. All it takes is entering into BA-SIC and giving a PRINT command-or. better yet, the abbreviation "?" (question mark) and the math problem that needs to he solved

For quick answers, BASIC is not difficult to use. In fact, it can be a pleasure: unlike many calculators, BASIC adores standard algebraic notation and defity handles multiple parentheses. For instance, if you wanted to find out

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Figure 2: The ASCII table written in BASIC. If you want to refer to it while in BASIC, renumber it starting with 9000. When you want to see the table without disturbing your program, type RUN 9000 < Enter>.

the sales tax on the purchase of a personal computer (assuming the price to be \$2,499.95 and the tax rate 6.5 percent), you could just type

? 2499.95*.065

and BASIC would respond with the answer you need: 162,4967.

ASCII CHARACTER TABLE When programming. I used to find myself paging through the BASIC manual in search of the particular ASCII code I needed to display a character on the screen. Today the manual rests undisturbed on the shelf because I use a utility program to pop up an ASCII table when I need I as You can get the same result with the simple BASIC program shown in Figure 2. The program displays the decimal AS-CII code for characters 32 and above, their hexadecimal equivalent, and the equivalent character that is displayed on the screen when using the CHRS function in BASIC.

I chose to start the table at 32 for simplicity's sake. Starting there avoids the need to trap the under-32 control codes that upset the neat order of the table and that clear the screen.

Although this program won't pop up of from inside an applications program, as a mylletic commercial kin, you can add of simulated concurrency to it by renumbering its lines to start at 9000 (or so) and asswing it as an ASCII file by adding the A soption to the BASIC SAVE command. Then, when you are programming in BA-Then, when you are programming in BA-Then, when you are programming in BA-Then, when you for program of the working on with the will effect the program you're working on with the will effect the program you're working on with the will effect the program you're working on with the will effect the program you're working on with the will effect the program of the working on with the will effect the program of the working on with the will effect the program of the working of the program of the program of the working on with the working of the program of the working of the program of th



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COMMERCIAL DESKTOP ORGANIZERS: MEMORY-RESIDENT UTILITIES

Quite a bit more polished than home-brew utilities, these programs vary in the features they offer and differ in their ease of use.

Once you've determined that a set of desktop utilities will make your life easier, you have a wide array of commercial programs from which to choose. Here is a quick look at several of the more popular programs available for adding functions to your PC.

HOMEBASE

While most desktop utilities are primarily oriented around their notenad functions. Homebase puts primary emphasis on its database functions. Its internal databuse is powerful enough so that if you don't make genuinely heavy demands on your data storage and reporting programs, you might just use Homebase instead of a dedicated database.

Besides its general-purpose database features, Homebase includes prefabricated templates for common desktop organizer features like a message pad and address book. The user interface is exemplary-even flashy-presenting a combination of horizontal menus and zooming vertical bar menus.

Homebase also includes the standard desktop calendar and calculator features. The Homebase editor is designed to mimic the WordStar editor. Its only drawhack is its lack of full word-processor printing abilities. Homebase's communications abilities go beyond mere dialing and include full terminal emulation. In addition, the program also allows you to issue several DOS commands from within other applications, puts a continuously running (annoying but removable) clock in the upper-righthand corner of the screen, and blanks your monitor if you don't press a key for more than 15 minutes.

Homebase is not completely memory resident; it requires the use of an overlay file to carry out some of its functions. Although this programming design saves memory and does not interfere with calling up the program from within other applications, it makes hard-disk operation of this utility preferable.

PC-DESK

PC-Desk is more like an elementary integrated program than a set of desktop utilities. The package includes a simplified address database, a word processor, a calculator, a timekeeping log, and a calendar and reminder system. The format of each record in the address database is factory preset and allows you to keep a wealth of information beyond merely name/address/telephone. Up to 200 reeords can be kept in a single file. Since it has most popular editing functions, its word processor facility can be used for more than just taking notes. It allows you to print letters, envelopes, and mailing labels.

The other PC-Desk features, however, simply seem to have been grafted on. The ealendar advances and retreats solely month by month. The calculator, although it works admirably, has a few bugs. For instance, a number that's too large spills over onto the next line of the screen long before an error message pops up, leaving numbers scattered across the screen that don't go away until you enter another full-screen function. Installation options are minimal. But perhaps the biggest shortcoming of PC-Desk is that it cannot be made RAM resident. It won't pop up in another program when you need it.

POP-UP DESKSET

Unlike other utility packages, the Pop-Up DeskSet is not one program but a set of utilities that can be separately loaded (and unloaded) from your system. These utilities consist of all the expected desktop organizing functions, including an alarm clock, a notepad, a calculator (and a feature-packed financial calculator), a calendar, a dialer, and, optionally, a telecommunications facility. In addition, the basic package also contains a pop-up utility that allows you to issue DOS commands from within other applications. It also contains another utility that permits putting one application on hold and running a second application by loading another copy of COMMAND.COM, thus creating a new DOS

One wonderful blessing of the modularity of the Pon-Un utilities is that each one is immediately available by pressing a single key combination. On the downside, more memory seems to be required for the same combination of desktop applications than with single-module packages, and a lengthy series of commands and options may have to be included in your AUTOEXEC.BAT file to get the whole system going.

The on-screen look of the Pop-Ups is quite plain. Only a limited facility is available for changing the color, size, and location of the screen area used by the utilities and other forms of eustomization. The notepad, in particular, seems hampered by a slender, half-width screen display. But the lack of aesthetics in no way limits the usability of the programs. For instance, the calculators are among the best, with true "paper-trail" tape, and the financial calculator is unmatched in power among desktop utilities. Pop-Up DeskSet offers a powerful enhancement to any system.

RESIDENT

Resident is not a RAM-resident deskton utility package hut a program that can make other applications RAM resident. It also includes one pop-up memory-resident utility, Notepad, an elementary word processor that uses the PC's arrow and function keys for control.

Resident can make nearly any program memory resident, allowing you to freeze one program, skip to another to carry out a specific function, then pop back to the original exactly where you left off. It does not allow concurrent operation but does permit cutting and pasting data between applications. Using Resident, you can turn your database into a pop-up telephone directory or your communications program into a telephone dialer. It may be particularly useful for a floppy-disk-based system, relieving the need to shuffle disks in and out of drives when shifting between applications.

Resident's primary obsacle is the limitde memory of most computers. Although the program requires only 12K bytes of overhead for each of its 26 applications (which can be made simultaneously memory essident) bus 24K bytes of working RAM, memory disappears very quickly when you use Resident with the growing number of programs that require 384K bytes of RAM or more.

SIDEKICK

SideKick combines the most-used desktop functions into a single memory-resident package. Those functions include a calculator, a calendar and reminder system, notenad, auto-dialer, and an ASCII table. The calculator mimics a \$9.95 handheld model, the notepad copies much of WardStar, and the calendar follows the Gregorian standard. The autodialer can pull numbers off the screen or look them up in a telephone directory. The interface and function keys are as consistent as possible across its internal applications. All functions are accessible within other applications and can be selected with a moving-bar menu or Altkey combinations. The first time a Side-Kick function is accessed, the procedure takes two steps: one key press to get to the main menu, then another to choose the function you desire. Afterward, you can shift in and out of the same function with a single keystroke combination.

Although all of SideKick's functions

K are incorporated into one module, Borland International supplies several ver-

sions with various combinations of features. You need only load (and use memory for) the functions that you plan on using.

One of the major strengths of Side-Kick is the versatility of its installation procedure. All important parameters of the program package can be modified (even the word processing control keys); windows can be enlarged, reduced, and moved; ports can be changed; and colors can be changed to suit your personal

Borland International also sells a companion program. Traveling Sidekick, which extends the abilities of the Sidekick package to include features helpful to businessmen who are often on the road. The extension includes a winyl to automate recordkeeping, as well as a report generator, special duabase conversion software so that appointments and addresses can be made instantly portable, printed reference materials, and a handful calculator the size of a credit



FACT FILE

Homebase Amber Systems Inc. 1171 S. Saratoga-Sunnyvale Rd. San Jose, CA 95129

(408) 996-1883 List Price: \$69.95 Requires: 256K RAM, two floppy disk drives or a hard disk. DOS 2.0 or

later.

In Short: A database-oriented set of desktop utilities that remain memory resident for instant access but require an overlay file. Features include database, nosepod (editor), dialer, communications, calculator, screen saver, clock, and the ability to run DOS functions from within applications.

Not copy protected.

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PC-Desk Software Studies Inc. 8516 Sugarbush Ct., #104 Annandale, VA 22003 (203) 978-2330 List Price: \$49 until Sept. 1; \$79

Requires: Memory needed depends on functions loaded. In Short: An integrated system consisting of a 200-record database, word processor with various print options, calentair, inteckeping log, calculator, and autodialer. Does not popup inside other applications. Not copy protected.

CINCLE 628 ON NEADER SERVICE CARD

Pop-Up DeskSet
Popular Programs Inc.
135 Lake St. #180
Kirkland WA 98033

(800) 447-6787 (206) 822-7065 List Price: \$69.95 (with Plus option, \$129.95) Requires: 64K RAM (more memory

needed to load several modules), any version of DOS. In Short: A set of memory-resident utility programs that can be loaded and unloaded individually; each utility can be accessed from within other applications. The series includes alarm (lock, calendar, notepad, plain and financial calculators, dialer,

communications system (optional), and the ability to execute DOS functions from within applications. Not copy protected. GRIGLE 427 ON READER SERVICE CARD Resident

Information Software Inc. 2639 Walnut Hill Lane, #135 Dallas, TK 75229 (214) 353-2966 List Price: S89.95 Requires: 64K to 384K RAM, depending on program being made resident.

In Short: A utility that makes virtually any application memory resident so that one program can be instantly started from within another. Includes

a pop-up notepad program. Not copy protected.

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SideRick Borland International 4585 Scotts Valley Dr. Scotts Valley, CA 95066 (800) 255-8008 (408) 438-8400

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In Short: A set of desktop utilities including notepad, calculator, telephone duler and directory, calendar and appointment book, and an ASCII look-up table that allows a great degree of installation freedom. Traveling Sale/Ris adds a binder, handheld calculator, printed reference materials, and conversion software. Not

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■ PC LAB NOTES

fects. When you want to check the table, just type RUN 9000, and the table will display without disturbing the rest of the code you have in memory.

PRINTER CONTROLS The ability to control your printer with DOS alone is severely limited. The only real support DOS gives is the ability to change paper-width specifications and dump graphics to IBM control-code-compatible printers. Taking command of the host of features now packed into most printers thus requires either visiting BASIC and sending a bunch of esoteric CHRS commands to the machine, or shopping around for specialized (and expensive) software that handles at least some of your printer's abilities.

Everyone seems to have written a pro-

DOS prompt. Some are more confusing to use than the printer's escape sequences themselves. I've found that creating a separate program for each major printer function is the easiest technique, so I've made programs like DRAFT COM LETTER-COM, and ITALICS.COM that allow me

to customize each print job.

Writing several printer control programs is not as much bother as it might at first seem. Every program that sends a command to the printer is pretty much the same except for the actual command codes that must be sent, so all printer control programs can be built on the same foundation-a generic prototype program written in assembly language to be customized with the required code sequences.

Such a prototype program can be creatgram to issue printer commands from the ed using DOS's DEBUG program, as

;in single quotes; max. 62 characters]

DERUG -N FF. COM

XXXX:0100 JMP 160 XXXX:0102 DB 12,07,FF ; [Enter printer control code here in thex characters, separating each with the comma; end with PF; maximum 32 characters

XXXX:0105 [Enter a carriage return--the number at ; left will vary

-A 122 XXXX:8122 DB 'Form Feed sent to printer.\$' ; |Enter text to the sent to the screen here, ending swith a dollar sign (\$) and enclosed

xxxx:013D [Enter a carriage return-the number at left [will vary] -A 168 XXXX:0160 HOV AH, 05 XXXX:0162 MOV BX,0102 XXXX:0165 MOV DL, [BX] XXXX:0167 CMP DL.FF XXXX:816A JE 8171 XXXX:816C INT 21 XXXX:016E INC BX XXXX:016F JMP 165 XXXX:0171 MOV DX,0122 XXXX:0174 MOV AH.09

:|Enter a carriage return]

-BCX CX 8888 :7A

Figure 3: A printer control program you create with DEBUG. This one sends a form feed to the printer. Don't type in the nine characters and numbers (with colons in the middle) at the beginning

of most lines; the PC provides these. End each line by hitting the Enter key. If the beep annoys you, eliminate the "07," from the line reading "12,07,FF." You don't have to type in the comments that appear after the semicolons.

XXXX:8176 INT 2

XXXX:017A

XXXX:0178 INT 20

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shown in Figure 3. This program does two things: first it sends the appropriate command sequence to the printer, then it prints out on the screen what it has done to confirm your command. The control sequence can contain up to 32 hexadecimal control or text characters: the confirmation message, up to 62. You simply insert the appropriate codes or text in the space reserved in the program.

The program requires that a final bexadecimal FF character be added to each control sequence. This character is not sent to the printer but tells the program that the command is done and to ignore the balance of the 32 spaces reserved for control sequence characters. Similarly, a dollar sign must end the text sequence to signal to DOS the end of the text.

To use the DEBUG script, start the DE-

BUG program by typing

called FF.COM, you would type

DERUG

followed by the full name of the program that you want to create, remembering that the filename extension must be .COM for a working program. For instance, for a program to send form feeds to the printer,

DEBUG FF.COM

Italics

* Double space but

Reset

DEBUG responds by telling you that the file does not already exist (if it does, you'll probably want to try again with another command to set a new name).

For the form feed program, the appropriate control sequence would be 12.7.FF. The 12 is the form feed control code itself, the 7 makes the printer beep so you know the command got there okay, and the FF signals the end of the command. An appropriate text string would be "Form Feed sent to printerS'

After you've created one program, you can use it as the basis for customization. Merely use DEBUG to load your prototype into memory, then use the N command to rename it. Change the command sequence by typing A 102 followed by the command sequence, sending a blank line to end it, then A 122 to change the text sequence. Finally, use the W command to write the finished file to disk. In 5 minutes you can create half a dozen printer control programs. (Some of the more common printer control codes to use with the program shown in Figure 3 for Epson or IBM printers are given in Figure 4.)

For another printer-setup utility, see SETUP.COM in Programming/Utilities, PC Magazine, Volume 5 Number 12, page 267. Both FF.COM described here and SETUP.COM can be downloaded from the PC Magazine Interactive Reader Service, (212) 696-0360 (8 data bits, 1 stop bit, no parity).

Winn L. Rosch is a contributing editor of

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hold page length 1B.41.18.1B.43.21

1B, 48 * Indicates same code used for IBM Graphics Printer Figure 4: Additional printer control codes. Use the codes given in the DEBUG program in Figure

1B.34

3 instead of the form feed example shown. For instance, to make your printer skip six lines before and after each perforation, change the line reading "12,07,FF" in Figure 3 to "1B,4E,06,07,FF". Some commands can be used in conjunction with one another; others may cancel each other. Check your printer manual for compatibility between modes. The same technique, using different codes, works for non-Epson printers.

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EXPLORING THE EGA, PART 1



In this first of two installments you'll learn what IBM should have told you about the EGA and get a set of utility programs for exploring its potential.

BM's introduction of the Enhanced Graphics Adapter (EGA) and Enhanced Color Display (ECD) in the fall of 1984 came with little warning, and as a result the rest of the industry has been slow to catch up with software support and compatible hardware. Now, however, almost 2 years later, the EGA has established itself as the high-resolution color graphics standard for all but specialized applications

Whether you're a veteran owner or recent purchaser of an EGA, you may have been disappointed that the documentation IBM supplies with the EGA board covers only installation. Most manufacturers of EGA compatibles don't do much better. Most EGAs do not come with demonstration programs. Although the improved resolution of the EGA is obvious to the eye. it's certainly not clear what other magic is packed into the board.

I'm going to show you some of this magic. One of my goals is to make the EGA a more familiar and friendly part of your system by untangling the confusion of video modes, resolutions, colors, pages, and fonts. The other is to provide you with a set of utilities you can use to tailor the EGA's operations to your needs.

With only a few exceptions, the programs presented here use the BIOS Interrupt 10h video routines to communicate with the EGA. The techniques I'll be demonstrating in the course of this article can be incorporated into programs written in high-level languages, however, since many of them (such as Turbo Pascal) also support BIOS calls. (BASIC, of course, is

the most notable exception.)

To go beyond what I'll present in this article and in Part II (next issue), you'll have to get a copy of the EGA Technical Reference. At this writing, this is available only as an update to the two-volume IBM Options and Adapters Technical Reference (IBM part number 6322509, \$125). The article on the EGA in the April 1985 issue of PC Tech Journal (Volume 3 Number 4) also has a good description of the BIOS calls.

CREATING THE UTILITIES The short programs presented here are written in assembly language. For most of them, however, you do not need to use the IBM or Microsoft Macro Assembler, Instead, I have presented the programs in a script format that allows you to create the executable .COM files using DEBUG (2.0 or later). Here's how to do it: First, type each listing into an ASCII

 Although the improved resolution of the EGA is obvious to the eve. it's certainly not clear what other magic is packed into the board.

file with the extension .SCR. You can create the ASCII file using EDLIN, Word-Star's non-document mode, Microsoft Word (save unformatted), XyWrite, or any word processor that can create ASCII files. You'll notice that each program listing has at least one blank line near the bottom. That blank line is very important, so make sure your .SCR file has a blank line in the same place. You do not have to type in the semicolons or anything to the right of the semicolons: these are comments and labels to help you understand what is going on in the program.

Second use DERLIG to create the executable .COM file with the command

DEBUG < filename.SCR

where filename is the name of the .SCR file. If you accidently omit the left angle bracket, enter Q to exit DEBUG and try again. When DEBUG creates the .COM file from the .SCR file, watch for error messages. An error message from DE-BUG indicates a mistake in your typing. As an alternative, you can skip the cre-

ation of the .SCR file by just entering

DEBUG

and typing in the lines directly.

If you have a Macro Assembler and some experience in assembly language programming, you may want to convert these .SCR listings into .ASM programs. This will facilitate your own enhancements and experimention. To assist you in this, I've included jump and call labels in the comment section of the script listing. However, there are a number of other con-

■ PROGRAMMING/UTILITIES

siderations involved in converting the .SCR file to an .ASM format (such as using SHORT jumps, specifying numbers with the H suffix for hexadecimal, substituting labels for data references, etc.), so I can recommend trying this only if you know what's going on.

If you have a modern, of course, you can save yourself the trouble of having to enter the programs at the keyboards, you can download them without charge from PC Meagarine's Interactive Reader Service, (21) 806–8060. Use 300 or 1,210 bps. 8 data hits, 1 stop hit, no partly, 1ft your communications software supports communications software supports of the communication of the communica

DISABLING ANSLSYS If you have device drivers or remain-resident programs that do things with the display, particularly with colors, I suggest that you first try out these EGA utilities without loading those other programs. You'll see later, for instance, that the EGA has alternative methods for coloring your display. In particular, you'll want to try out my utility programs without ANSLSYS. ANSLSYS always assumes that the display is 25 lines long, and in Part 2 of this article we'll be experimenting with some displays that are not 25 lines long. ANSI SYS also does not correctly determine the starting address for different video pages.

VIDEO MODES The Enhanced Graphics Adapter supports a variety of video modes, including all those supported by the original Color/Graphics Adapter (CGA) and the Monochrome Adapter. Additional EGA modes provide higher-resolution graphics with more colors.

Figure 1 shows all the video modes supported by the EGA. The video modes available on your EGA depend upon the type of monitor attached and the amount of memory installed on the adapter board. The Resolution column indicates the number of displayable scan lines (going down the screen) and the number of displayable dots (going across the screen).

The number of scan lines that the EGA displays is either 200 (which is the same as

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		ECD	350×640	25×80	14x8	16/64		6	
445	Graph	CD&ECD	200x320	25×40	8 x 8	4		1	
6	Graph	CDSECD	200x648	25 x8#	14x8	2		1	
7	Text	MONO	350x720	25 x 80		4		8	
0,9,10 11612		Used int	modee not a ernally by E	upporte GA for	d by E loadin	g fonts	-		
13	Greph	CDAECD	200x320	25×48	8x#	16	4	(64E) (128E) (256E)	
14	Greph	CDAECD	200x640	25 x 8 F	#x8	16	2	(64K) (128K) (256K)	
15	Graph	MOSIO	350x640	25 x 8 P	14x8	4	1 2	(64K) (125K)	
16	Greph	ECD	350x648	25 x 8 P	14x8	4/64 (64R) 16/64 (12FR)	1 2	(128K) (256K)	

Figure 1: The EGA video modes. Which video modes you can use and how they look on your screen depends on the monitor attached to the EGA and the omonan of memory on the odapter.

Monochrome Adapter). An EGA attached to a regular Color Display cannot use the 350-line modes. An EGA attached to an Enhanced Color Display (ECD) can use eler 200 or 350 lines. The difference between 200 and 350 sean lines is obvious on the screen you can count the individual scan lines on your screen in a 200-line display, but with 350 lines you cannot. We'll

Figure 2: Use DEBUG and this EGAMODE.SCR file to create EGAMODE.COM, which you can use to select an EGA video mode or display the current

the CGA) or 350 (which is the same as the Monochrome Adapter). An EGA attached to a resular Color Display cannot use the the same as the see later that these two basic modes of operation are also very different in ways other and the same as the see later than these two basic modes of operation are also very different in ways other as the same as the see later than these two basic modes of operation are also very different in ways other as the same as the sam

If you have 25 lines of characters displayed on your screen (which is normal but definitely not the only way you can use your EGA), the Box column in Figure 1 shows the resolution available for each character. If you have an Enhanced Color Display (or compatible) attached to your EGA and you get only an 8 by 8 character box, your EGA DIP switches are not set correctly.

The program EGAMODE shown in Figure 2 will let you switch to any video mode supported by your monitor. After you create EGAMODE.COM from EGA-MODE.SCR using DEBUG, you can run the program by typing

EGAMODE mode

where mode is the video mode (expressed as a decimal number) to which you want to switch. The normal modes for the DOS command level and most programs that use text are 3 (for color displays) and 7 (for monochrome). You can run EGAMODE without a parameter to see what your current mode is.

You can also use the PC-DOS MODE command to switch between video modes, hut that command is limited to the text modes and uses key words rather than numbers. The MODE parameters and the

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corresponding video modes are BW40 mode 3, you s (mode 90, C040 mode 1), BW80 (mode 2), C080 (mode 3), and MONO (mode 7), Modes Othrough 6 are the Color-fragheis scheme for modes. Mode 7 is the Monorhome Adapter modes. Mode 7 is the Monorhome Adapter mode. All of these modes are supported by the EGA when it is connected to the process monitor.

Modes 8, 9, and 10 are the additional PC/r graphics modes that are not supported by the EGA BIOS. Modes 11 and 12 are used internally by the EGA BIOS to load fonts into the adapter.

You'll notice that the table begins with pairs of modes that are the same: 0 and 1. 2 and 3. 4 and 3. On the EGA both modes in each pair are identical, as they were identirical on the CGA if you used its regular, direct-drive connector. However, if you used the composite video output on the CGA with a black-and-white monitor, modes 0.2, and 5 disabled the color-burst signal. The EGA does not support composite monitors.

EXPERMENTING If you experiment with EGAMODE, you may be surprised that the EGA BIOS allows you to change the mode to one that your monitor doesn't support. I. too, was surprised at this. If you happen to accidently do it, close your eyes and enter EGAMODE 3 (for color) or EGAMODE 7 (for monochrome) to get things back to normal.

You'll notice that you can switch to graphies modes at the DOS command level, but the screen operations are significantly solver. This is because the BIOS has to construct the dot patterns of each character on the screen instead of just writing the ASCII code of the character to play memory, If you run an applications program that does not set the video mode but writes directly to the display, you'll get garbage on your screen if you enter it in a graphics mode.

Normally when the EGA switches to a new mode, it clears out all video memory. However, if you add 128 to the mode number when running EGAMODE, the EGA BIOS will set the mode but will retain the contents of the screen memory buffer, so the screen will not be cleared. (The PCij-BIOS functions similarly.) However, the cursor will be returned to its home position in the upper-left-hand corner. If you're in mode 3, you should try entering EGAMODE 131

to see what happens. The screen will still have all the contents, but the cursor will now be up at the top. For a more interest-

EGAMODE 144

This sets the EGA to mode 16 without clearing memory. You'll have some snowy garbage scattered on your display. Those are the characters stored in the EGA

 You may be surprised that the EGA BIOS allows you to change the mode to one that your monitor doesn't support.

memory that are now being interpreted as dots. As you can see, the text and graphics modes are very different. Now go back to mode 3 with

EGAMODE 131

The characters from the graphics mode now appear as various colored blocks on the screen.

I suggest you don't run other programs

after resetting the mode with 128 added to it. When a program reads the mode through the BIOS, the BIOS reports this high-numbered mode. This may completely confuse an applications program. I'll refer to the video modes by number

throughout this article, so keep the chart shown in Figure 1 handy. Or better yet, memorize it. (Don't worry, I won't quiz you later.)

THE EGA AND OTHER ADAPTERS If you have your EGA connected to a color

you have your EGA connected to a color monitor, you can still have a Monochrome Adapter in your system as well. Similarly, if your EGA is connected to a monochrome display, you can also have a Color/Graphics Adapter in your system. EGAMODE will not switch between the two adapters, however. Use the PC-DOS MODE command to do that.

MODE command to do that. If you have a Hercules Graphics Card attached to a monochrome monitor, it too can coexist with an EGA attached to a color display. However, you'll want to use EGAMODE before running any program that uses the "page I" graphics of the Hercules card. Here's why: Monochrome mode 7 uses memory starting at segment address B000h for the display. Color modes 0 through 6 use memory starting at segment address B800h. No conflict so far. However, the Hercules card can use both "page 0" (starting at B000h) and "page I" (at B800h) for graphics. Many programs that support the Hercules card use "page I" graphics. You may know about this because some of these programs require that you run HGC FULL before you use them to enable this second graphics page.

Hercules "page 1" graphics would normally conflict with a CGA (and hence an EGA) board. However, the EGA graphics modes 13 through 16 all use display memory beginning at A000h. This allows you to move the EGA out of the way before you use Hercules graphics. To do this, you would enter

MODE CORØ EGAMODE 16 MODE MONO

The first program switches to the EGA in mode 3 (in case you're not already there); the second sets the EGA mode to 16, which uses segment A000h); and the third program switches to the monochrome disays (If your EGA is attached to a regular Color Display, use EGAMODE 14 indicated). We see that the second with the second program is without any restrictions. If you have seed, Now you can add these three lines to the back file before the HCC PULL statements, you can add these three lines to the back file before the HCC PULL file.

After you're done and want to return to the EGA, use

grams that use Hercules graphics. But if

MODE COBØ

This statement can be placed after an HGC.

HALF statement in a batch file.
You won't need to do this for all pro-

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you ever see garbage appear on a color display attached to an EGA while graphics appear on a monochrome display attached to a Hercules Graphics Card, that means there's a memory conflict.

PAGES AND PAGES The chart in Figure I has a column called Pages that shows the number of video pages on the EGA for various modes and memory sizes. Particularly in character modes, the display you see on your screen takes up only a small amount of the total EGA memory. The extra memory is used for other video pages.

The EGAPAGE program, shown in Figure 3, lets you change the video page from the DOS command level. The BIOS keeps track of cursor positions for eight separate video pages. When a video mode is first set, all of the cursors are set to the upper-left-hand corner. To switch to page

I, execute

EGAPAGE 1 To go back to page 0, execute

EGAPAGE Ø

The EGAPAGE program doesn't accept page numbers higher than 7, but it also doesn't check to see whether the current video mode supports less than 8 pages. Without a parameter, EGAPAGE tells you the current video page.

EGAPAGE is useful when you have something on your screen that you want to return to later. Just change the video page, do your other tasks, and then come back to the original video page. Resetting the video mode, however, blanks out the contents of all video pages.

(ANSI.SYS users, take note: The EGA uses different starting addresses than the CGA for these video pages. Although the starting address is stored in the BIOS data area, ANSI.SYS doesn't use it and will not correctly handle anything other than page 0 on the EGA.)

For a while I experimented with a resident program that changed video pages from the keyboard, the idea being that you could do something on the DOS command level on page 1, switch to page 0, go into your word processor, and then look at what was on the page 1 screen. In use, however, this program became very confining, since to often looked as if I had been

N DGAS	NGE. COM	
A 100		
	#11A	
DB.	"Current Vide	o Page le 85°
DB BOV	AL. (9930)	# #RGIN: Convert
	AL20	. Parameter
.78	#129	2 JC GETFAGE
CKP	AL. 07	# See if above 7
JB CMP JA HOV DET	0129	2 3A CETTAGE
MCV	AE, 85	; Set page
1307	10	
	AK. 07	2 CETTAGE:
INT	10	through \$106
ADD	[0110],60	, Store in etring
MOV	DE,0102	
HOV	AR, 89	; And display it
INT	23	
INT	29	/ Terminate
zα		
3A		
×		

Figure 3: EGAPAGE.COM lets you change the video page from the DOS command level.

magically transported back to the DOS command level, although I was still in my word processor.

THE 64-COLOR PALETTE For the 350-line modes, you'll notice I've indicated the available colors in Figure 1 as 16/64. This means that only 16 colors can be displayed simultaneously on the screen, but these 16 colors may be selected from 64 colors. In the video modes that use 200 scan lines, only 16 colors are possible.

That 64 colors are available only on the ECD in 350-line modes in not a coincidence or the whimny of the people who designed the ECA. The Ethanced Color Display runs at a faster horizontal syor: rate in order to fit in all 300 lines. The display is triggered to use this higher horizontal syore are by the polarity of the vertical syor signal. At the same time, it uses six color signal, and the same time, it uses six color signal. At the four that the regular Color Display uses. (The Monochrune Display uses two signals for color video and Internal.)

The 4-bit color code in 200-line modes is called IRGB. The RGB part of this stands for Red, Green, and Blue, and I stands for Intensity. Thus, 16 colors are available: low- and high-intensity versions of 8 colors.

The 6-bit color code in 350-line modes can be represented as "rgbRGB" with both primary (RGB) and secondary (rgb) red, green, and blue signals. The lower-case letters are sometimes referred to as "½ intensity" (which are darker) and the uppercase letters are "½ intensity" (brighter). In both cases, these are digital

signals, either on or off, so the 350-line modes have a total of 64 colors.

CGA COLOR To understand how color works on the EGA and what we can do with color, let's first review what we know about color on the CGA:

In CGA text modes, each character stored in the adapter memory has a corresponding 1-byte "attribute" that controls the foreground and background colors of the character. The lower 4 bits of this attribute contain an IRGB code for the foreground color, which is the color of the character.

The next highest 3 bits of the attribute contain an RGB code (nonintensified) for the background color. The highest bit con-

trols blinking.
In this respect, the EGA works the same way and uses the same attribute codes as

the CGA.

(On the CGA, you could disable blinking, and thus make the higher 4 bits a full IRGB code for the background, by writing

ing, and thus make the higher 4 bits a full IRGB code for the background, by writing the value 09h to register 3D8h. The EGA does not support this register, but you can do the same thing with a BIOS call: MOV AX. 1863h

MOV AX, 100 MOV BL, 0 INT 10h

This enables background intensity. A value of 1 in BL enables blinking.)

The big difference between the CGA and the EGA in Mandling color is this: On the CGA, the 4 color bits represented by the IRGB code go directly to the video connector and then the monitor. On the EGA, the 4-bit color code passes through an "Antibute Controller" before going out to the monitor. In 200-line modes, this Attribute Controller can translate a 4-bit IRGB code into any other 4-bit IRGB code. In 350-line modes, the Attribute Controller can translate it into any 4-bit IRGB code to mandle it into any 6-bit IRGB code in 1850-line modes, the Attribute Controller can translate it into any 6-bit IRGB code to mandle it into any 6-bit IRGB code into any 6-bit IRGB c

tion is controlled by values loaded into the EGA "palette registers."

Figure 4 shows the default mapping of the IRGB codes into rgbRGB codes in the EGA 350-line modes. The binary representation is helpful because it shows how the bits correspond directly to the letters in "IRGB" or "rabRGB." The cotal (base

rgbRGB code. The Attribute Controller

functions as a lookup array. The transla-

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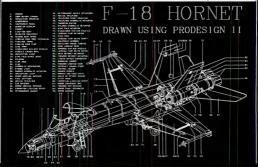
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8) representation for the rgbRGB code is actually more useful because the first digit represents the ½-intensity rgb signal and the second digit is the ½-intensity RGB signal. (To those readers who have only recently been mastering hexadecimal, I apologize for dragging in octal at this point.)

Note that for the intensified colors, the default mapping combines the 5-intensity signal with all three V-intensity signals with all three V-intensity signals so that, at the bottom of the chart in Figure 4, the "bright white" color has all bits turned on. Note also that the EGA brown is faked: it uses a dark green and light red signal. Forty-eight other possible rgbRGB codes aren't used at all in this default mapping.

On the DOS command level, and in many programs that don't use color, characters are represented with an attribute code of 07h (hexadecimal). This means the background is black (0) and the foreground is white (7). However, the EGA maps these two codes into black and white only by default. We can change the mapping to whatever we want by loading different values into the EGA palette registers.

That's what EGACOLOR (shown in Figure 5) does. It takes two arguments, both of them octal numbers. The first twodigit number is the IRGB color value from 0 through 17. The second is the rgbRGB color value from 00 through 77 that you want the IRGB code translated into. Leading zeros are not required.

For instance, executing EGACOLOR ØØ Ø1 EGACOLOR Ø7 76

B BG/	ACDSOR, CON	
A 181		
	AX. [985D]	: let Perameter
CALL	9217	CALL CONVERT
HOV	AX, [886D]	, 2nd Perameter
		ALL CONVERT
WOV	Bir, AL	y Seve in BR
WOV	AX,1800	; Change Palette
INT	28	through BIOS
		/ Terminata
22.0	AL,30	/ CONVERT:
CKF	At. 28	/ Chack if one digit
	6127	1 JX ALLDONE
		I Convert to binery
HOY	CL. 03	? Three bit shift
SEL	AL, CL	
ADD	AL, AN) Put two together
127		ALLIDORE:
* CX		
38 W		

Figure 5: EGACOLOR. COM changes the default color mappings by manipulating the EGA palette registers.

	IRC	B code		Default	rgbRGB	mapping
Color	binary	octal	hex	binary	octal	hex
Black	2222	99	0.8	000000	0.0	88
Blue	8881	81	8.0	000001	81	81
Green	8818	82	82	866816	82	82
Cvan	8811	83	03	888811	83	03
Red	8188	84	84	888188	0.4	84
Magenta	8181	85	85	206161	95	85
Brown	9119	86	86	818188	24	14
White	8111	87	87	868111	87	97
Dark Grey	1000	18	88	111000	78	38
Light Blue	1681	11	69	111001	71	39
Light Green	1818	12	Øλ	111916	72	3 A
Light Cyan	1011	13	ØB.	111811	73	38
Light Red	1188	14	ØC.	111100	74	30
Light Magenta	1101	15	ØD.	111101	75	30
Yellow	1110	16	36	1111110	76	31
Bright White	1111	17	82	111111	77	3 5

Figure 4: The CGA-compatible 4-bit IRGB color code is mapped to a 6-bit rgbRGB color code on the Enhanced Graphics Adapter.

changes everything normally displayed as black to dark blue, and everything normally white to high-intensity yellow. If you're not using any other program to control color and run these two programs, your screen will suddenly burst into yellow-onblue colors. The color translation is done in the EGA hardware.

If you have your EGA connected to a regular Color Display (which supports only 200 scan lines and 16 colors), you can still use EGACOLOR but only with the 4-bit IRGB codes in octal (i.e., 00 through 17) for the second argument.

If you change the video mode with EGAMODE, the colors go back to normal. A mode reset always loads up the EGA palette registers with the default mapping. The best thing about using the EGA palette registers to control color is that programs that do not reset the video mode will still use the colors you've set. Later on, we'll see how to get the palette registers loaded even for programs that set the video mode.

the video mode. By running EGACOLOR 64 times with

the command EGACOLOR Ø XX

where XX is an octal number from 00 through 77, you can see all 64 colors as background colors. But don't waste your time. There's a better method.

THE EGA'S 64 VARIETIES As I mentioned previously, you can't display all 64 colors at once on the EGA. It's just impossible. But with a little "gonzo program-

ming," even the impossible is possible, so let's do it anyway.

The EGAPALET program shown in Figure 6 displays all 64 EGA colors on an Enhanced Color Display. If you have a PC AT, substitute a value of 2B for 22 in the line near the top that begins with DB.

When you run the program, you should have eight rows with eight different colors in each. The display is much more stable in each. The display is much more stable tween the rows of color on a PC or XT is tween the rows of color on a PC or XT is rown formal. If the bottom row is larger than the rest on your machine, increase that number rest on your machine, increase that number than the rest (or if you don't see smaller than the rest (or if you don't see rows at all), decrease the number. Make it

no bigger than 2Bh.

You may have to turn up your contrast
and brightness controls to see the full range
of colors. Even then, some of the colors

 The EGA brown is faked. It uses a dark green and light red signal.

may appear very similar. If you have a magnifying glass or camera close-up lens, you can check that they do indeed use different dots. Press any key to leave the program.





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The EGAPALET program actually uses only eight color values, 0 through 7, and displays eight columns of blocks using these values. However, every 1/400 fa second, EGAPALET changes these eight palette registers, so the colors on your screen change. It controls the timing by counting horizontal scan retraces.

The default EGA color mapping uses the top row and bottom row of EGAPA-LET's 64 colors, except for brown, which is in the third row, fifth from the left. If you see a color you'd like to use in EGACO-

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AX,3000
BE,AX
61,61
AL,08
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let ES to 5898
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lem block character
smoor of Flome
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JEZ LOOPS
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AL, DE
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从,起
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                                                                         AX
6156
AL. 26
00, AL
00, DA
61, DA
6143
CX, 10016
CX, 10016
6133
AX 5007
                                                                                                                                                                                                                                               foost DX
"Count" value
foo if end of colors
B C
```

Figure 8: EGAPALET.COM displays all 64 colors on an Enhanced Color Display. Increase the value after DB for machines faster than a stock PC.

LOR, you can determine its octal code in this way: Count down to the row from the top, starting at zero. That's the first digit. Count over to the column from the left, starting at zero. That's the second digit. Didn't I say octal was better for colors?

N EGA	BORD.COM	
A 100 HOV	AR, [005D]) Got Parameter
CNP	AL, 30	Check for blank
	83,26 8313	1 JS ALLBONE
BUE	A1, 10 CL, 63	y Convert 2nd digit
ROV		
ADO	AL, AR	; Stick two together
ADD HOV HOV	80 AL 80,1001	: Set border through
	10	2 8108
INT	20	7 Terminate
2 CI		
10		

Figure 7: EGABORD.COM changes the border color on an EGA, but you may not like the results.

THE EGA BORDER PROBLEM

350-line modes the EGA also allows you to set the border (called the "overscan register") to any of the 64 colors. Figure 7 shows a program to do this. You run it by typing

EGABORD XX

where XX is the two-digit octal code for an rgbRGB color.

But in case you haven't already heard, let me warn you: the results are pathetic. Not only is the border very skimpy, but using it causes some shading problems in the left two-thirds of the display. (If your EGA is attached to a regular Color Display, you don't have this problem. But again, in that case you can set your border to only I of the 16 IRGB colors.)

Bonders on the EGA are a problem, and the best way to solve the problem is to convince yourself that an EGA cannot display borders in 350-line modes. When you know something is impossible, it may cease to bother you. After a while, you may even prefer the black border. So let's go through some display arithmetic to prove it. Then you can relax knowing vou're not missing out on anything

In 200-line compatibility modes, the EGA (like the CA) uses the 14.318-MHzclock available on the system bus for the ott clock. At each pulse of the dot clock, the adapter sends a cotor signal to the dispay. But, in 390-line enhanced modes, play. But, in 390-line enhanced modes, play in the same amount of time, so the EGA uses an one-board 16.257-MHz crysal for the dot clock.

This already looks ominous: the EGA displays 75 percent more scan lines with only a 13.5 percent higher dot clock frequency.

In 200-line compatibility modes, the horizontal scan rate is 15.75 kHz. This is the rate at which each scan line of the screen is displayed. Dividing the dot clock frequency(14.318 MHz) by the horizontal scan rate results in 909 dots, the equivalent

```
N EGATINE.COM
A 188
JMP
            81A3
   6888,5682,2883,5684,5085,8086,6E18,2B11,6E15,1R16
5F88,5582,3F83,5584,5B85,8C86,6E18,2B11,6E15,1R16
5E88,5482,3E83,5484,5R85,8C86,6E18,2B11,6E15,1R16
DW 5D88,5382,3D83,5384,5985,8C86,6E18,2B11,6E15,1A16
DW 5C00,5302,3C03,5304,5805,8C06,6E10,2B11,6E15,1A16
DW 5F00,5502,3F03,5504,5B05,7C06,6610,2B11,6615,1216
DW 5D88,5382,3D83,5384,5985,7C96,6618,2811,6615,1216
DW 5B88,5382,3783,5184,5885,6C86,5818,2811,5815,8816
MOV AL,[895D] , Get parameter
                                    ; Get parameter
; Use lowest 7 bits
            AL,87
            AB,14
                                    : Multiply by 28
ADD
WOV
WON
            AX. 8183
                                    : Add offset of beginning
            SI,AX
DX,03D4
                                       Make that the source
                                       CRT Controller Register
            CX,888A
                                    : 18 words to load
LODS
                                    : OUTLOOP: Get byte
CUT
                                    ; Output to register
; Loop OUTLOOP
; Terminate
            8188
INT
R CX
BE
```

Figure 8: EGATIME.COM lets you adjust timing values on the EGA to allow a proper-size border to be displayed.





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tion es a correctable typewriter - perfect	Fancy Font 129	J RAM III AT (Tell Tree) Cell
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Fox and Galler Ourckropert 138	Expansion Board 0 to 576K\$42	Serial Port, Clock, MS/DUS 2.11 Cell
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■ PROGRAMMING/UTILITIES

of 114 characters. The displayable area uses only 640 dos for 80 characters. The horizontal retrace requires about 8 characters. The 26 characters left love are are in the border area. If you divide the horizontal scan rate (65 HzL) by the vertical scan rate (65 HzL) you get 262 lines. The displayable area needs only 200 lines (25-character rows with 8 scan lines each). Again, some of the feltowers occur during the vertical retrace (when the signal jumps either and content of the displays), but the rest are available for the top and bottom border region.

In 350-line modes on the Enhanced Color Display, both the dot clock frequenev and the horizontal scan rate are slightly higher. The 16.257-MHz dot clock frequency divided by the 21.85-kHz horizontal scan rate results in 744 dots or 93 characters, of which 80 are displayed and about 10 occur during the horizontal retrace. That leaves about 3 characters for the left and right borders. The horizontal scan rate (21.85 kHz) divided by the vertical scan rate (60 Hz) shows that the EGA can display 364 lines: 350 of them are used in the display and 13 of them occur during the vertical retrace. That leaves about 1 scan line for a top and bottom border.

The reason the EGA can't do borders in 350-line modes is thus very simple: Very soon after it finishes a sean line, it begins the horizontal retrace. Almost immediately after completing the last sean line, it makes a vertical retrace. The border area is untouched by the dot gun.

In fact, because of the very tight timing restrictions, the display is not fully blanked during the whole horizontal retrace. That's why you get a faint background shading when you try to display a border. The unwanted shading is actually the border color being displayed during the horizontal retrace. It's faint because it's stretched out.

Now that you know a border is impossible in 350-line modes, you can skip the next section.

NOW FOR A REAL BORDER Sooner or later, you are going to read about a way to do a real border on the EGA, so you might as well read about it here. Opinion is divided over whether this technique ean damage your monitor. Enough said? You

H HOAD A 188	CRISH. COM	
382 382	#13A	. JND SECOND THEF
DB		
	0. 0	
POSE		* BEENT DITTS *
PURE	B.X	
CSI		
MOV	BB, [61#2]	, Get current color
230	AL,60) Get scan code of he
CHP	AL,1A	Check if [
31	BIIC	JE DECREMENT
CHP	AL.18	Check If
JKR	#133	JES SKIPALL
INC	88	, increment the coler
JMP	#118 BE	JEP SHORT CONTINUE DECREMENT:
AMD	35.35	
MOV	AR, #2	Check for ALT key
INT	16	
TEST	AL. 90	
JI	#133	· JE SEIPALL
BCK.	AX,1881	, Set border
INT	10	through Blos
CRI		
BOY	[6162].88	. Save new color
FOF	BX	
CEI		
JMP	FAR [8183]	, De old let, 9
WOV	AX,3599	: INIT: Get old
	21	1 1nt. 0
	101031.BX	
WOV	101051.85	
WOW	DE, 0107	; Sat new Int. 9
MOV	AX,2509	
INT	21	
WOV	DK. 013A	; Terminate and
		etey resident

Figure 9: EGABORDR.COM is a resident program to change border colors using Alt-[and Alt-].

don't really want a border, do you?

OK, OK, so you do. Here's the premise: Although the Enhanced Color Display is designed for a horizontal sync rate of 21.85 kHz, it has some tolerances. Most ECDs can run about 5 percent lower. If we program the EGA to do so, we'll be able to

fit in enough dots to make a border.
(Although the Enhanced Color Display normally runs at a vertical syne rate of 60 Hz, it is actually rated for vertical synes between 50 Hz and 60 Hz. Thus, getting a top and bottom border is fairly easy. It's the left and right borders that cause the

problem.)
The EGATIME program shown in Figure 8 is designed to be run in mode 3 with an Enhanced Coto Display attached, but it does not check to make sure you are in compliance with these requirements. It takes a one-digit parameter from 0 to 7 to select from 8 sets of possible values besteft profits and the selection of the se

less chance your ECD can handle it. The parameter of 7 loads the normal values. You can experiment with EGATIME by first running EGABORD 1

to select a blue border. Then try

EGATIME 6

and if that doesn't make your screen look like a television that needs servicing, try something lower. You can always get back to normal with

EGATIME 7

If you really want a border, using EGA-IME to get it is up to you. If you decide to use it, you may also want to add EGA-BORDR (listed in Figure 9) to your ATDEXEC.BAT file. This is a remain-resident program that lets you change your border to any of the 64 colors from your keyboard. Alt-| advances through the 64 colors, and Alt-| goes backward.

PERMANENT COLOR MAPPING The EGACOLOR program maps attribute colors into screen colors, but these color mappings revert to the defaults whenever program changes the video mode. I'm sure some readers are already thinking about writing a resident program that would intercept interrupt 10h, watch for a mode change, and then set the colors you want right after the BIOS has changed the video mode.

Stop. There's a better way to do it. When the BIOS resets the video mode, it loads the EGA registers and sets the val-

 Sooner or later, you will read about a way to do a real border on the EGA

ues in the BIOS data area based on a set of "video parameters" that include the default colors. These video parameters are normally located in the EGA BIOS. Howvert, you can direct the BIOS to use an alternative set of video parameters by creating a remain-resident program with the parameters and setting a pointer located in the BIOS data area to point to; This may

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■ PROGRAMMING/UTILITIES

sound tricky but it's not: the EGA BIOS is set up to allow you to do things like this legitimately and easily

On page 107 of the BIOS listing in the EGA Technical Reference, you'll see a pointer called SAVE PTR stored at memory location 0000:04A8. It points to a set of seven other double-word (i.e., segment and offset) pointers, called DWORD_1 through DWORD 7, DWORD 5 through DWORD 7 are reserved for future use.

DWORD_1 points to a 1472-byte location in memory that contains 64 video parameters for each of the 23 video modes supported by the EGA. Twenty-three? Where did 23 video modes come from? First, there are 17 video modes, 0 through 16, that are the same as those in Figure 1. Although the EGA does not support modes 8 through 10 (the PCjr modes) and uses modes 11 and 12 internally when loading fonts, these are still included in the table. But modes 0 through 3 at the beginning of this table are for the 200-scan-line versions when a regular Color Display is attached to the EGA. Modes 15 and 16 are for EGAs with only 64K of memory. So, after these 17 modes, the table next contains values for modes 15 and 16 when 128K or more is attached to the EGA. Finally, 350-scanline versions of modes 0 through 3 are included when an EGA is equipped with an Enhanced Color Display. That makes 23. (Note: Although page 103 of the EGA

Technical Reference indicates in large letters that the Interrupt 43h vector points to the Video Parameters table, this is not so. Interrupt 43h actually points to the Graphics Character Table, which is the font used to construct characters in graphics modes. Interrupt 44h, which the EGA Technical Reference mistakenly indicates as pointing to this Graphics Character Table, is not used by the EGA BIOS. This change may seem odd since Interrupt 44h is used by the PCjr to point to the Graphics Character Table, but that's the way it is.)

For each video mode, the 64 video parameters include the values loaded into the palette registers. But if we tried to change the table directly, it wouldn't work since they are stored in the EGA ROM BIOS. and we can't write into ROM.

So, first let's create a remain-resident program called EGAPRMOV (which stands for "EGA Parameter Move") that

8 BOX	PRIMOV. COM	
A 188		
CLD		
809	AX, AX	
ROV	BO, AX	; Set IS to let segment
201		
LOS	81, [\$4A8]	, Get SAVE_PTR
ROY	DI. 913C	, Set up for trenefer
HOY	[\$4AB].DE) New SAVE_PTZ
261		
HOY	(SAAA).CB	
2038	CB	
207	23	
1977	C2.0000	; 14 Double Words
HOY BY		
251		
LOS	81, (4134)	; Cot DVORD_1 pointer
MOV	01,0156	, for up for transfer
26:		
MOV	[#13c],o;	, New DWORD_1
65:		
MOY		
PURG	CS SS	
) 23 * 64 bytes
23.25		
MOV SIN		
	27.0716	
# CX		

Figure 10: EGAPRMOV.COM moves video parameters and pointers to an area in RAM where they can be modified by other programs

simply moves the set of seven pointers and the entire video parameter table into RAM. This program is shown in Figure 10. It need be executed only once during your PC session.

Now we can manipulate the video parameters. Figure 11 shows a program called EGACOSET ("EGA Color Set") that replaces the default palette values for video mode 3 (in 350-line mode) with those of your own choosing. The two lines with the 16 hexadecimal numbers are yours to customize. For instance, if you

#1, #1, #2, #3, 14, #5, #6, 3E 3#, 31, 32, 33, 34, 35, 36, 32



Figure 11: EGACOSET.COM sets the mode 3 video parameters for customized palette register values. Modify the DB lines for the color mappings you want.

the EGA will map color 00 (black) to 01 (blue), color 07 (white) will be mapped to 3E (bright yellow), and color 0F (bright white) will be mapped to 32 (bright green).

If your EGA is attached to a regular Color Display, change the line reading ADD DI,05A3 to ADD DI,00E3 and use only color values that range from 00 through IF in the DB lines.

When you first execute EGACOSET, nothing will happen. But if you then change the video mode with an

EGAMODE 3

your screen will display yellow-on-blue. Once EGACOSET is executed, the EGA BIOS will load these values into the palette registers whenever mode 3 is set. When a program tries to display a whiteon-black character, vellow-on-blue will show up instead. EGACOSET is not resident like EGAPRMOV, so you can experiment by running different versions of it without using additional memory.

If you put both EGAPRMOV and EGACOSET in your AUTOEXEC.BAT file, almost every program that uses blackand-white in video mode 3 will use your customized color scheme instead. It's as simple as that.

There are exceptions, however. Some "EGA-aware" programs load the palette registers themselves after they load. Such programs include Microsoft Word 2.0 and the new EGA drivers for 1-2-3, Release I.A. BASICA 3.2 loads OK but then changes the palette registers back to normal on exit.

If you've also found an EGATIME setting that works for you. Figure 12 shows a program called EGABOSET that will also adjust the CRT Controller registers to these values when mode 3 is set. EGABO-SET assumes that EGAPRMOV has been loaded. It's set up for the same values as EGATIME 0 and a blue border. If EGA-TIME 0 didn't work but something else did, count down the lines of numbers beginning with DW in EGATIME.SCR (starting at 0) and substitute the number in the line beginning with DW in EGABO-SET.SCR. If you want a border color other than blue, change the number after the line that begins DB in EGABOSET to the hexadecimal rgbRGB code for the border

color you want.

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Figure 12: EGABOSET adjusts video parameters so that EGA timings for mode 3 allow a border color on a mode reset.

Again, for people with a regular Color Display attached to an EGA: Do not use EGABOSET. If you want a border color set automatically, go back to EGACO-SET. Change the line reading MOV

Part 2 of this article

will cover creating your own fonts and loading

them into the EGA.

CX,0010 to MOV CX,0012. At the end of the second line of numbers that start with DB, add a comma, 08, another comma, and the color value of the border you want. The line after R CX should be changed from 2B to 2D.

THERE'S STILL MORE Part 2 of "Exploring the EGA," in the next issue of PC Magazine, will cover creating your own fonts, loading them into the EGA, using a 512-character set, and switching to the 35and 43-line modes. In addition to giving you an introduction to EGA graphics, I'll show you how to construct a small "feature" for the EGA's feature connector to allow you to create your own video modes. including a 120-column display.

Charles Petzold is a contributing editor of PC Magazine.

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SPREADSHEET **CLINIC**



Here's a group of handy 1-2-3 macros and tips, including a novel use of @NA, a warning beep to signal when a macro shouldn't be run, and a fumigator for a Release 2.0 bug.

TRANSLATION RUG IN 1.2.3. RELEASE 2.0

Release 2.0 of 1-2-3 has a utility that trans-

lates worksheets to different file formats. You would use it when you wanted to translate a 2.0 file into a format that is to be run under 1A. Obviously, there are some formulas that are legal in 2.0 but illegal in IA, and these will produce a "Formula translation error" message. You have to go through the new file and fix them so they will work in 1A. However, there are some copies of 2.0

in which the translation utility gives you the same error message even when the formulas are perfectly valid in IA. What causes the error message is the existence of named ranges in the original 2.0 file. For some reason the translation utility can't handle them. The translation will work if you delete the named ranges with the Range Name Reset command, but then your model may not work right.

I have found an easy way to build a macro to reinstall the ranges and their names in the copy translated into I.A. First. make a backup copy of the 2.0 file you want to translate and then use the /Range Name Table command to build a table. You'll get something like columns A and B only of Figure 1. Next put the formula

+"/rnc"&All&"-"&Bll&"-"

in cell C11 and copy it down column C. Your range table will now look very much like the table in Figure 1. Use the /Range Value command on column C to turn the formulas into values. Both the source range and destination range should be all range names.

			C C
11 12 13 14 15	COST FORECAST LOOP REVENUE TOTAL	C3 G52H56 Q43 B43E46 E23	/rncCOST"C3" /rncPORECAST"G52B56" /rncLOOP"Q43" /rncREVENUE"B43E46" /rncTOTAL"E23"
	Formula in	cell Cll:	+"/rnc"salls"~"sBlls"~"

Figure 1: A technique for reinstalling range names from a file that has been translated from 1-2-3, Release 2.0, into 1A.

the data in the column. Next, delete all the range names in the 2.0 file with /Range Name Reset and use the translation utility to translate the file.

Once the translation is finished, read the new .WKS file into 1-2-3. Release 1A. If you give the top of column C a macro range name and run the macro, all the ranges will properly reinstall.

> Ulysses C. Wang Urbana, Illinois

Fortunately, the later copies of 2.0 have corrected this bug. If you do run into it, another way to reinstall range names in the IA file is to use the macro in Figure 2. Be sure to give the cells to the right the names

17 /c"R-NAME" [right] /c"ADDRESS" /rnc R-NAME ADDRESS

~{down}{left}/xg\T Figure 2: An alternative macro for reinstalling on their left. Put the cursor on the first name in the range table and hit Alt-T.

ANOTHER USE FOR @NA

Most spreadsheets have an @NA function, which is used as a temporary place holder for missing or "not available" data. You need this because spreadsheets usually treat blank cells like zeros, and there are times when zero and "not available" aren't the same thing. For example, the average of a list of numbers will be different if one number is zero, as opposed to not being there at all. @NA also serves as a reminder to go back to that cell and enter data, since all formulas that refer to it will also display NA.

There are times, though, when I use @ NA differently. I intentionally put it into a cell to cause the results I want. Figure 3 is a good example of this. There are five factors to consider in a compound-interest problem: present value, interest rate, number of years, number of compounding periods per year, and future value. Given any four of these five factors, you can solve for

■ SPREADSHEET CLINIC

		D		
3	*** COMPOUND	INTEREST ***	Entry	Calculated
5	Present Value	\$	\$10,000.00	NA
6	Nominal Annual	Interest %	12.5	82
7	Compounded	times/year	2	
8	Number of Years	n n	6	302
9	Future Value	\$	NA	\$20,698.90

Figure 3: An interesting use for the (@NA function.

@LN(E9/E5)/@LN(E6/E7/188+1)/E7 (E6/E7/188+1)^(E7*E8)*E5

F7:

the fifth. (The only exception to this rule is the number of compounding periods per year. You can't express that as a simple equation but must solve for it by trial and error. However, you usually know the number of compounding periods and almost never have to solve for it.)

In Figure 3 the data goes into column E and the answers appear in column F. To solve for future value, put the known data in cells E5 through E8. In cell E9 you put (inNa and, if column F contains the right formulas, you get the answer in cell F9. Similarly, to solve for the interest rate, put the 6t NA in F6 and the known data in the rest of column F contains.

The reason this system works is that cach formula in the answers column uses every cell from the entry column except the one it is solving for. The formula for future value in F9 uses values in cells E5 through E8, but not in E9. However, all the other formulas in column F use E9. Thus, when E9 is "not available," you get NA in every cell but the one that displays the answer you want.

Martin Goebel

Wedgewood Park, Newfoundland Canada

This is an amusing use of @NA. 6xNA doesn't cause the calculation you want to happen—rather, you're using it to suppress the ones you don't want. If in Figure 3 there were a number instead of @NA in cell E9, you would still get the right answer in cell P5. But you'd dosg et a distracting burch of irrelevant answers in cells F5. F6. and F8.

1-2-3 MENUS FOR FLOPPY DISKS

I've devised a very simple menu system that helps me keep track of several hundred 1-2-3 files on about 30 disks. Figure 4 contains an example of the kind of AU-TO123.WKS file that I keep on every disk. It contains a one-line description of the files on that disk and the simplest possible autoexecuting macro; file

Now when I load I-2-3, it lists the files on disk by reading in AUTO123. By executing the /fr command, it also displays the file names in the control panel. To retrieve a file. I just move the cursor to the filename and hit Enter. Obviously, I have to update the menu when I add or crass files.

Jerry Anderson Cincinnati Ohio

CONTROLLING AUTOEXEC MACROS In the Spreadsheet Clinic of March 25, 1986 (PC Magazine, Volume 5 Number 6), there was an interesting submission on writing autoexec macros that would run only on certain days—once a week, once every 2 weeks, etc. In your editorial comments you wrote that you couldn't think of a way to make the autoexec macro run only at the end of every month. If you put the following line at the beginning of your '0 macro, it will run only on the last day of the month:

/xi@day(@today+1)⇔1"/xq
... Macro
Continues ...

Alan Tiet Los Angeles, California

Quite so. I got several letters with end-ofmonth solutions, but Mr. Tiet's was the tightest line of code.

SPEEDING UP MACROS

Depending on their complexity, some 12-3 marcs can take a long time to execute. One way to speed them up is to turn off automatic recalculation with /wgm the first line of your macro. End your macro with (take), or /wgms[ack] if you with the spreadsher in auto recalc mode. The result is only one worksheet recalculation during the entire macro. This will save time when the macro contains commands, such as /Copy and /Move, that normally

force an automatic recalculation.

There are some macro operations that require recalculation in order to arrive at correct results, however, so be sure to put in {calc}s where they are necessary.

Ralph Sappe Poughkeepsie, New York

And one of the advantages of Release 2.0, of course, is that you can include a limited {recalc} command that recalculates only part of a large streadsheet.



Figure 4: A menu and autoexec macro for AUTO123.WKS.

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■ SPREADSHEET CLINIC

MACROS THAT WARN YOU IF THEY SHOULDN'T RE DUN You may sometimes find that some 1-2-3

macros should be run only if certain conditions are met. To give but one example, a macro that does a lot of data manipulation can cause trouble if you haven't entered

> /xial <5"/yyyyy/xq macro o . . if all is well.

certain conditions and will beep to warn you if those conditions are not met.

the data before you run it.

The single line of macro code shown in Figure 5 is a good way to start macros that should be run only under certain conditions. In this specific case the test condition is very simple—the macro will not run if A1 is less than five-but you can make the overall criterion as complex as neces

Figure 5: A macro that will run only under

sary. If the test condition is not met, the macro beens five times to warn you, then quits. (Y is an illegal choice after the slash command, so you will get as many beeps as you have Ys.)

Russell Baetke Seattle Washington

 This macro, which beens if a test condition is not met, will also send the cursor to a block of text that explains why the macro didn't run.

If you want to give the user a little more help, you might change the line of code to this:

/xiAl<S"/yyyyy{esc}{goto}MESSAGE"/xq

This macro will beep if the test condition is not met, but it will also send the cursor to a cell named MESSAGE. This would be the beginning of a block of text that explains why the macro didn't run and what you should do about it

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77.

Power user

Tips on getting perfect envelopes from WordPerfect, patrolling the border in WordStar, and speeding up file transfers and setting colors in Crosstalk.

ENVELOPING WORDPERFECT

Typing envelopes to go with letters is a bothersome chore. WordPerfect 4.1 makes it easier than most word processors do by providing a type-through (typewriter enulation) mode, but an even better method is to use a macro that automatically conies the address to the envelope.

To create the macro ENV in WordPorfer 4.1. type the listing in Figure 1. Step 1 starts the macro definition. Steps 2, 3, and 4 define a four-line address block and cropy it to the buffer. Steps 5, 6, and 7 move to the top of the document, create a new finagae, and move the cursor to it. Step 8 sets the margins for the address area of the envelope. I use a left margin of 5 and a right margin of 95, but this will vary on your printer.

Step 9 inserts blank lines on the envelope. I use ten lines, but this also is printerdependent.

Steps 10 and 11 put the address on the new page and print the new page. Steps 12 and 13 go to the top of the doc-

ument and delete the entire envelope page.

Step 14 ends the macro definition. To use the macro:

(1) Put an envelope in the printer.
(2) Position the cursor at the beginning of the address in the letter.
(3) Type Alt-F10 env < Retum>.

If you use envelopes without a preprinted return address, you could add your own return address between steps 7 and 8 of the macro, adjusting the number of blank lines in step 9 to compensate for the added lines.

pensate for the added lines. Michael D. Nugent, Ph.D. Aubum, Washington 1) Ctr1-F10 env <Return>

2) Alt-P4

3) Down-Arrow Down-Arrow Down-Arrow Down-Arrow

4) Ctr1-P4 2

5) <Home> <Home> Up-Arrow
6) Ctrl-<Return>

7) Left-Arrow

8) Shift-F8 3 55 (Return> 95 (Return>

9) Shift Pl 6 10 (Return)

10) Ctrl-F4 5 11) Shift-F7 2

12) <Home> <Home> Up-Arrow

13) Ctrl-<Pg Down> y <Delete>
14) Crtl-Fl#

Figure 1: A macro to create an envelope-addressing format in WordPerfect.

With WordPerfect, you can print the everlope, then exast he address you've just printed from the document immediate-by. With programs like WordSta. With the size that you save the file before printing, you'll want to add a "display meand for will also the them." The message should remind you to but an envelope or paper into the printer, as appropriate. The prints pause command the will then interrupt the print routine until you can load an envelope or not the printer as a propriate. The prior pause command you can load an envelope to those the oritine until you can load an envelope to those the oritine.

fore you restart printing.

—M. David Stone

BORDER WARS

A recent PC Magazine Power User column contained a patch to change the border color while using WordSur. However, the border stays the new color even after you leave WordSur. For those of us who use one screen color for WordSur and another for DOS, this is a problem. I've devised a small WordSur patch that will change the border color when leaving WordSur.

At location &HZA7, WordStar provides a place to jump to a user-installed routine just before exiting the program. So all we have to do is install a separate copy of the border-setting routine at that adverses. If you're installed the border-setting WordStar patch, here's how to add a routine that will reset the border color to the default black when you quit WordStar and return to DOS:

Make a copy of WordStar's WS.COM file, put it on the same disk with DEBUG .COM, then get into DOS and type DE-



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LOWEST PRICES BUG WS.COM. At the DEBUG prompt. GENERIC CAD type

D 336 33F

and hit Enter. Hopefully, you will see a row of all zeros. (If not, try the same thing starting at 270, typing D 270 27F. If you see a row of zeros, use 270 in place of the two 330s below).

Next, type

U 2A7 2A9

and hit Enter. You will see one of two things. If no previous exit routine has been installed, you will see

xxxx: 02A7 MOP xxxx: #2A8 NOP xxxx: 02A9 RET

You may, however, see a jump instruction, such as

xxxx: 02A7 JMP Ø34B

The address that follows the JMP may vary. The jump shown here is installed by the WSCOLOR.BAS program that comes with WordStar and jumps to a routine that clears the screen upon exit. Make a note of which of the two results you get, and, if there is a JMP instruction, record the number jumped to.

Now we are ready for the patch itself. Type everything below, hitting Enter at the end of each line, including the two blank lines. If you got the first result (no jump instruction), then type the patch as shown excent for the parentheses and what's between them. If you saw a JMP instruction, then on the line after INT 10, replace the RET with JMP nnnn, substituting the number you recorded for nnnn.

A 2A7 JMP 330 A 330 MOV BX. dddn MOV AH B INT 16 RET (or JMP nnnn)

When you run WordStar, the border should now turn back to black upon exit to DOS. If you want a different color, then substitute a different number for the last two digits of the 0000 above. For example, 0003 will turn the border light blue, 0004 to red, 0001 to dark blue.

> Matthew Meighan Carbondale, Illinois

It's probably a good idea to reset everything when you're done but are you sure you need a different color for DOS and WordStar? DOS looks awful in the default oray-on-black It's simple to customize the colors in DOS and WordStar: we've pub-

 For those of us who use one screen color for WordStar and another for DOS, here's a small WordStar patch that will change the border color when leaving WordStar.

lished several color-setting methods in User-to-User and Power User. You can use the WordStar border patcher we published to set colors in both WordStar and DOS.—Paul Somerson

SPEEDING FILE TRANSFERS Crosstalk XVI has a block size parameter

(BKSIZE) that sets the size of the data block used during Crosstalk's proprietaryprotocol file transfers. The larger the block size, the less often Crosstalk adds errorchecking information, and the less errorchecking "overhead" is involved.

On most phone lines occasional errors are likely, so a small block size minimizes the amount of information that has to be resent. But on connections where errors are rare-such as when two computers are connected by an RS-232 cable or when you are using modems with dedicated lines or ones that have their own built-in errorchecking protocols-a larger block size speeds up file transfer. According to its Version 3.5 manual,

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Crosstalk allows a maximum block size setting of 10. If you use the help command for information on BKSIZE, however, the help screen says you can use a maximum block size of 16. And if you try entering a block size of 6. And if you try entering a block size of 6. say, 45, the program gives the crror message that BKSIZE must be between 1 and 40. This last message is correct: Crosstalk 3.5 works just fine with a BKSIZE of 40.

Version 3.6 of Crosstalk uses the same numbers in the manual, the help screen, and the error message, but it will accept

Crosstalk will not save

color settings to the .XTK file if you use its SAve command. So you must use your favorite text editor to insert the commands manually.

block sizes all the way up to 255 without problems.

Name and address withheld

With Version 3.6 you must be careful when changing block size. If you enter 256, Crosstalk will respond that the block size must be between I and 40, but If you enter a very large number, the program does strange things. Entering BK 800 on my copy of Version 3.6 sets the block size to 32, and entering BK 635 sets the block size to 173.

Mother problem with using a large flock size it had Cossalk our nar of memory and not realize it. I ran into this problem while running tests with 9600-bys moderns, using a BKSZEE setting of 205 of working memory but didn't warm me about in. The result was a file that seemed to transfer without errors but wound sp with large chanks of Fhe in the middle of the test. The problem disappeared when I made the KMddst maller, freeing II made the KMddst maller.

more working memory for Crosstalk to use. The moral here is to remember to double-check what you're doing, since Crosstalk seems to get confused easily. —M. David Stone

CROSSTALK COLOR REVISITED
Richard Forand's letter and John Dickin-

son's reply in Power User concerning crosstalk XVI color screens (PC Magazine, Volume A Number 22) were correct as far as they went. However, for good results a script file is not the place to put SCreen commands. Color commands—three of them—should be included in the command (XTK) file. And even then there's a trick to it.

Forand's letter stated that to customize color in *Crosstalk*, you could enter the command by typing

SC a fb

where "SC is the abbreviation for the Screen command, a specifies which of Crosstalk's screen characters to change, f specifies the foreground color, and b specifies the background color." [See the letter following for a listing of character and color codes.—Ed.]

Unfortunately, Crosstalk will not save these color settings to the .XTK file if you use its SAve command. So you must use your favorite text editor to insert the commands manually, each on a line of its own.

Then comes the trick. The three SCreen commands won't all work if they're consecutive or even located close to each other in the XTK file. In a typical 86-line file, I've found that they work with Crosstadi. 3.5 if the display is set up with one SCreen command on line 11, another on line 40, and a third on line 83. When the colors are loaded as part of the file, they stay setmeduring the status line color—until I elineding the status line color—until I eline 15.

ther change them or return to DOS.

My favorite display is set up with these

SC N Cb (at line 11) SC H Yr (at line 40)

three commands:

SC L Yr (at line 85)

This gives me a blue background with cyan text, a yellow-on-red command line, and highlighted characters.

A warning: Once you've entered the SCreen commands in an .XTK file, do not

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SCreen N C SCreen H M SCreen L Wb

Flaure 2: The listing for COLOR XTS, an XTALK script file that will set normal characters to bright evan on a black background, highlighted characters to bright maseuta on a black background, and command fine to bright white on a blue background. This file can be executed at the "Command?" prompt, using the command: DO COLOR XTS < Enter > .

use the SAvc command to make subsequent changes in that file. Use a text editor instead. If you use Crosstalk's SAve command, you will lose the screen commands from the file.

Arthur Mercier Union City, Connecticut

Here are some additions to Richard Forand's letter and your comments.

(1) Red is also an available screen color. The code is R or r. The complete Crosstalk character type and color letter codes are as follows:

Valid Character Type Codes N-Normal characters H-Highlighted characters

I .- Command-line characters Valid Color Codes

K-Black M-Magenta B-Blue Y-Yellow G-Green R-Red

C-Cyan W-White

NOTE: Uppercase for bright, lowercase for normal (2) Forand notes that "color codes en-

tered in lowercase appear normally, and those entered in uppercase are displayed in high intensity." This applies to foreground colors only. Using uppercase for background colors will cause blinking displays.

(3) When color customization commands are written into the command files. the status line color will stay set. Changes that Crosstalk makes to give information about the capture buffer will temporarily replace the status line custom colors, but the custom colors will return when the

R. Leonard Gibson

Cambridge, Massachusetts

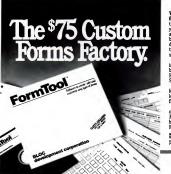
I'm a heavy user of Crosstalk, Version 3.5, and have never experienced any problem with the color on the command line re-

SCreen L Wb

maining set. I use the command

buffer's status is reset.

for a bright white foreground on a blue background. If I use the same command with an uppercase B for background, the command line will blink. This will happen when any background color is set to "bright" on the command line.



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Another, similar problem crops up with the SCreen command when using VT-100 emulation. If Crosstalk has normal characters set to a bright color (using an uppercase color code, as in "SCreen NC"), any inverse video operations coming from the host will blink. This yields a guaranteed headache for any screen-intensive applications, but the fix is easy. Just use the "normal" color attribute ("SCreen N c") instead of the "bright" color.

The SCreen command can be added to any Crosstalk configuration file (*.XTK) to provide default colors, but the user must enter these commands with an ASCII editor, since Crosstalk's SAve command will not save these colors to the file. An alternative is to create a script file containing the SCreen commands (see Figure 2), and execute it from the command line or a previously assigned function key. Bill Woolf

Silver Spring, Maryland

While two of these three letters refer specifically to Crosstalk, Version 3.5, after experimenting with Versions 3.5 and 3.6, I found that all the comments apply to both.

Messrs. Mercier and Woolf obviously disagree about the best way to set colors. but for the record, both methods work. The advantage of Mercier's approach is that Crosstalk wakes up with the colors you want. The advantage of Woolf's approach is that you can use Crosstalk's SAve command without losing the color settings in

Another advantage of Woolf's procedure is that you can store several sets of colors in different script files and minimize eyestrain by changing colors during long on-line sessions. And if you run into the blinking problem during VT-100 emulation, you can likewise change colors auickly and easily

the XTK file.

The blinking problem during VT-100 emulation is the one comment I was not able to

verify, as I lacked a suitable host computer The fix seems to make sense, though, and I'd be surprised if it didn't work.

It's also useful to know that if you accidentally set the display blinking by using an uppercase letter for the background color, you can turn off the blinking simply by giving another screen command. And both Mercier's and Woolf's suggested display colors are worth a look. -M. David Stone

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It's awfully annoving to have a long modem transmission suddenly disrupted when a Call Waiting message blurts onto your line. Because of the potential damage to data, computer users who spend a lot of modem time have resisted signing up for this service or have installed second lines for their systems.

Mike Ossing of Columbus, Ohio, and Bill Pratt of Redmond, Washington, recently sent us notices from their local phone companies giving instructions for canceling Call Waiting on a call-by-call basis. To cancel the feature before you dial, as spelled out in an Ohio Bell brochure: "From a 12-button Touch-Tone phone dial *70. From a rotary dial or 10button Touch-Tone phone, dial 1170. Then dial the number you want to reach for a conversation that will not be interrupted by your Call Waiting service. . .

To cancel Call Waiting during a call (incoming or outgoing): "Ask the party you're talking with to 'hold' for a moment. Press the receiver button and listen for the dial tone. From a 12-button Touch-Tone phone dial *70. From a rotary dial or 10button Touch-Tone phone, dial 1170. Then, after you hear several bursts of tone. you will be reconnected automatically to the party who is waiting on 'hold.' '

Call Waiting turns itself back on after the canceled call finishes. And the phone company doesn't charge extra for canceling the service. If it doesn't work yet for your particular Call Waiting service, get in touch with your local phone company and complain.

PAUSE, S'IL VOUS PLAIT If you distribute disks with batch files on

them to non-English-speaking users, the message "Strike a key when ready . . . ", generated by the PAUSE command may be meaningless. To remedy this, substitute your own message by using ECHO and get rid of the normal English message by redirecting PAUSE to NUL. A French version would look like this:

ECHO OFF ECHO Presser une touche pour continuer PAUSE >NUL

Unfortunately, this feature seems to work only in DOS 3.0 or later

Chinh T. Neuven St. Bruno, Ouebec Canada

Redirecting messages to NUL is a useful technique that can also prevent general batch file screen clutter. Most real power users have learned to start their systems by creating a RAMdisk and copying their most frequently used files to it. Even with ECHO OFF, the result is a string of "I File(s) copied" messages. To keep the screen clean, add a ">NUL" to the end of each COPY instruction.

PreSe TOGGLER

It's really frustrating to hit PrtSc accidentally. If your printer is on, you have to wait until it finishes typing the contents of the screen and then readjust the paper to the top of the next page. If it's off, your system will hang until DOS realizes that the printer is not going to respond. When you hit Shift-PrtSc. DOS issues

Interrupt 5, which first looks at a location in low memory called STATUS_BYTE to see whether your system is already dumping a screen to the printer. If STATUS BYTE is equal to 1. DOS thinks a screen dump is taking place and exits the routine without dumping another screen to the printer. If STATUS BYTE is equal to 0. the routine sets STATUS BYTE to 1 so that it cannot interrupt itself, then does the actual dump, and finally resets STATUS _BYTE equal to 0 and exits the routine.

```
A 100
PUSH DS
MOV AX, 0050
MOV DS.AX
MOV BYTE PTR [0000],01
POP DS
INT 20
RCX
E
```

N DISABLE, COM

N ENABLE.COM

E 18A 8

Figure 1: Instructions for creating DISABLE.COM and ENABLE.COM PriSc tagglers. Use the DOS COPY CON: function or a pure-ASCII ward processor (like WordStar's N mode) to type everything above

into a file called SCRIPT Make sure you leave a blank line above RCX, and be sure to hit the Enter key after each line, especially the last ane. Then put the SCRIPT file onto the same disk as DEBUG.COM. Version 2.0 or later. and type DEBUG<SCRIPT.





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1708 Westgate Road • Suite A Eau Claire, Wisconsin 54703 CIRCLE 256 ON READER SERVICE CARD 188 ' PRTSCTOG.BAS -- by Steve Dozier 110 OPEN "R",1, "DISABLE.COM",1:FIELD #1,1 AS AS

128 FOR X=1 TO 14: READ CHAR: LSET AS=CHR\$ (CHAR) 130 PUT #1, X:NEXT: CLOSE: RESTORE

140 OPEN "R",1, "ENABLE. COM", 1: FIELD #1,1 AS A\$ 150 FOR X=1 TO 14:READ CHAR: IF X=11 THEN CHAR=0

160 LSET A\$=CHR\$(CHAR):PUT #1,X:NEXT:CLOSE 170 DATA 30.184.80.0.142.216.198.6.0.0.1.31.205.32

Figure 2: BASIC program that creates DISABLE.COM and ENABLE.COM programs to toggle PrtSc function on and off.

This means you can disable the Shift-PrtSc routine with a simple assembly language routine, DISABLE, COM, which sets STATUS BYTE to 1. A similar routine, ENABLE.COM, can turn it back on by setting STATUS_BYTE to 0. You can create both files in DOS using the DEBUG script in Figure 1, or in BASIC using the PRTSCTOG.BAS program in Figure 2.

Steve Dozier Tucson, Arizona

It's a shame DOS doesn't let you toggle PrtSc on and off directly, but this does the trick. If you rarely use the Shift-PrtSc function but have a habit of activating it when you don't want to, you can put DISABLE .COM in your AUTOEXEC.BAT file and leave it more or less permanently off.

BASIC DEBUGGING

BASIC is great for interactive programming, but its debugging tools are quite primitive. One of the most irritating limitations is that when you make a simple correction to a single line (even a remark) BA-SIC flushes all your variables, closes all your files, and forces you to start the program over to test the correction.

When the interpreter finds an error, it prints an error message and halts the program. In many cases, you could continue running the program if only you could reenter the offending line and reexecute it. To make such on-the-fly corrections, examine the erroneous line with the LIST command. (Note: the problem line will already be displayed if it contains a syntax error.) Then type the following command in direct mode:

CHAIN MERGE "CON", ERL, ALL The cursor will drop down to the next

key the bad line, and press Enter and then Ctrl-Z and then Enter again. The program will continue where it left off. The next time you list or save the program, it will contain the repaired program line.

Another tip on smart BASIC debugging is to avoid error traps (ON ERROR GOTO) unless they are absolutely necessary. They tend to hide errors that need to be caught, and you will find yourself unable to get to the root of a malfunction. My programs trap errors right at the source, then turn error trapping off as soon as possible. For example:

180 '-- Print report --118 ON ERROR GOTO 138 128 GOTO 158 138 PRINT "Printer ERROR. Hit a key" LPRINT "ABC Company Report" print rest of report ...

This example assumes that any printer errors will surface during the printing of the first line of a report. The error trap itself resides directly above the possible error, and error trapping is on only during the printing of that line. I use a similar layout when opening files. Printer and disk I/O are about the only places that an error trap is really needed. You can write program code to test for any other potential problems without resorting to BASIC's error handling.

Dan Rollins La Crescenta, California

Using CHAIN MERGE "CON" to fix a BASIC problem without shutting down the active program is a handy trick indeed. Your cursor may temporarily disappear while you're entering the new line, and you may have to hit the Esc key to erase a message on the screen before you type in the CHAIN MERGE ... command, but the technique can save a tremendous amount



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■ USER-TO-USER

of time. Note that while this will correct the problem line in memory, be sure to save the file to disk to make the correction permanent.

In the report-printing routine above, you might want to test the error that BASIC catches with an IF ERR=25 THEN... or IF FRI = 150 THEN ... to make sure that the actual problem isn't falsely reported as a printer error when it's caused by something else. However, Mr. Rollins is absolutely right in his advice to trap all the usual errors by writing thorough code, not by skimping on traps and waiting for a mistake to fall through to an ON ERROR statement.

IBM sets a big black mark for destroying its DOS and BASIC manuals. In older versions, the manuals were fairly complete. But IBM now puts some of both manuals' critical information into flimsy "Getting Started" and "Quick Reference" brochures that you're bound to misplace.

For instance, the error-message listing in the back of the current BASIC manual is alphabetical only. If you need an index of error messages by number, the manual refers you to a tiny 3- by 8-inch chart in the 'Quick Reference'' guide that you lost as soon as you took the shrink wrap off. IBM could have easily duplicated this tiny chart in the manual

REFRESHING PALISE

To pause for a keystroke in BASICA, most programmers use either 10 AS-INKEYS: IF AS-" THEN 10

10 MHILE INKEYS:WEND

A more natural way is to create a machine language subroutine at the beginning of your program and then call it whenever required. Simply insert the following code at the start of any program:

CLEAR,5686 1 DEF SEG-5888 2 FOR X.=# TO 6 3 READ Y. 4 PORE X.,Y. 5 NEXT

6 PAUSE-0 7 DATA 88,189,7,205,33,88,203

and then add a

100 CALL PAIISE

(substituting the appropriate line number for the 100) whenever you want to wait for a keystroke. The example here takes up seven lines, but you can use colons to concatenate it all to a single line starting with 0 and save the line as an ASCII file, then merge this file into any of your existing programs. I made the X. and Y. variables and line number 0 uncommon so that they don't interfere with ones already in your

The key you hit to break the pause is not stored in the keyboard buffer after the program execution continues. If you need to

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■ USER-TO-USER

read the key, change the "7" to a "1" in the DATA statement in line 7.

Frank Swenton Columbus, Ohio

This may be more natural than the usual methods, but it doesn't really work any better and won't compile as is. If you try it

ment, follow the CALL PAUSE with a 200 PRINT INKEYS

(substituting the appropriate line number for the 200).

CUSTOM 3.2 DOS

In the November 26, 1985, issue of PC

Magazine, Calvin R. Shields provided several patches for COMMAND.COM, which I promptly implemented. However, when DOS 3.2 became available, I found I After a short search with DEBUG, I found the new locations. For the ECHO+space +space fix, type everything below:

DEBUG COMMAND. COM E3A88 83 E3A89 F9 E3A8A 92 E3A8B 72

and do want the keystroke to print, after For ECHO OFF defaults for batch files, changing the 7 to a 1 in the DATA statetype

DEBUG COMMAND. COM E115E 82 E182C 88

The CLS patch in Mr. Shields's original submission is not required-apparently the programmers at IBM read PC Magazine and found out how many lines are on a standard video display.

> Ronald J. Berg Mountain View, California

Shields's submission (User-to-User, Volume 4 Number 24) defaulted COMMAND .COM to ECHO OFF (rather than the annoving ECHO ON, which forces users to brute-force it off in every batch file) and allowed an ECHO with two spaces after it to generate a blank line. He also explained why COMMAND.COM's CLS command cleared an extra line and showed how to

fix this DOS 3.2 is indeed an improvement over its predecessors (and more expensive, at just under \$100). Its XCOPY takes much of the stine out of copying and backing up files. REPLACE upgrades files almost automatically. ATTRIB is a tiny bit handier (but a far cry from what it should really do). DRIVER.SYS tricks your system into thinking a physical drive is actually two logical drives (like the single A:/B: floppy on a standard PC-XT). You can now specify how much environment space had to patch COMMAND.COM again. Thanks for the timely hints. Calvin vou want, and can use FORMAT without

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USER-TO-USER

having to worry about hard disk disasters. (And BASICA 3.2 adds a modicum of EGA support.) This tip makes the new DOS even better.

COMPAO UNPROTECTION

It's simple to modify the technique for unprotecting BASIC programs described in User-to-User, Volume 4 Number 25, and PC Tutor, Volume 5 Number 10, to work on non-IBM versions of BASIC. Instead of IBM's location 1124, use 1228 for Compag BASIC 2.11, and 1433 for Compag BASIC 3.11. If the location is included in the BSAVE operation, you may omit it from the BLOAD. Other non-IBM, non-Compag versions of MS-BASIC may use entirely different locations,

Wayne Orr Tullahoma, Tennessee

"Protecting" a BASIC file by saving it with the ",p" option doesn't really do much other than prevent naive users from listing the source code. The technique referred to in Mr. Orr's tip will remove the flimsy protection. First, get into BASIC and type

BSAVE "UN.P", 1124, 1

(substituting location 1228 or 1433 if you're using Compaq BASIC 2.11 or 3.11. respectively).

If you ever try to list a BASIC program and see an "Illegal function call" message, just type

BLOAD "UN P"

At this point you should be able to list the source code. If not, make sure you tried the proper offset (1228 or 1433) for the BASIC version you're using. Then resave the formerly protected BASIC program to remove the effects of the ".p" permanently. The only real way to protect BASIC code is to compile it.

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RESIDENT FORM-FEED PROGRAM

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L. R. Holliday Ponca City, Oklaho

N PORM	RFEED. COM	
JHP	6136	/ Jump to Init
DM.	0.0	I camb to Tite
STI		# New Int. 9
PUSE	AX	
IN	AL, 60	/ Got kay
CHP	AL.37	# See if PrtSc
JHI	012A	
HOV	AH, 02	; Check for Alt
INT	16	
TEST	AL,08	
J1	012A	
FUSE	DX	
NOV	DX.0000	: Chack printer
MOA	AH, 82	: atatua
INT	17	
TEST	AH, 00	
JI	0129	
HOV	AL. OC	Print formfeed
TNT	17	
POP	DX	
POP	AX	
CE	AA	
JHP	FAN [0102]	/ Wun old Int. 9
WW.	AX,3589	/ Init: eave
INT	21	Int. 9
MOV	[8182],BX	
MOV	[0184],28	
MOV		; Set new
MOV	AX, 2509	I Int. 9
INT	21	
INT	DK,0130	/ Terminate

Figure 1: This DEBUG script file FORMFEED SCR will create FORMFEED .COM. a resident program that sends a form-feed to your printer when you press All-PriSc. It's not long at all. The necessary program is shown in Figure 1 in the form of a DE-BUG script. You can either load DEBUG and type the lines as shown, or you can type the lines into a file called FORM-FEED.SCR and run

DEBUG <FORMFEED.SCR

Be sure to include the blank line (that is, a carriage return by itself) shown near the

bottom.

The FORMFEED.COM file created by DEBUG is the resident program. As you suggested, it uses Alt-PTSC. Note that FORMFEED.COM does not clear the keystroke from the keyboard handware but just branches to the previous Interrupt 9 keyboard handler after it's done. Thus, if you load FORMFEED twice, you'll get two form-feeds with an Alt-PTSC.

Before writing the form-feed character (a hex OCh) out to the printer, FORM-FEED does a printer status call to Interrupt 17h, so it doesn't hang if the printer is off-line.

SORTING-THE DIRECTORY BY DATE The most useful way to display a directory is chronologically by date, with the most recenly created or modified files at the bottom. Tom Sheldon's naticle on batch files in PC Lab Notes (PC Magazine, Volrica) of the bottom of the complex of the ways, to dischool with piping using the SORT filter, but the camples are flawed because the date in a DIR issing is displayed in month-day-year format for sorting. Including the sorting. Including the time field woods sorting. Including the time field woods.

useful, too, but that's complicated by the use of an A.M. and P.M. identifier instead of a 24-hour clock.

I've been using a commercial sort utility to do a directory the way I like, but it seems like overkill. Is there some way to get DOS to do it right?

> Michael Lampton Berkeley, California

There is if you have PC-DOS 3.0 or 3.1. These DOS versions contain internal trabies not endosh foreign-country infortion, including date formus; time formustion, including date formus; time formustion, including date formus; time formustion, including date for the congregation in severable for programs to use through DOS calls. Although most programs don't take advantage of this facility (it's not available in DOS 2.3.), the programs and commands includwith DOS 3.3.—such as DIR—alter their with DOS 3.3.—such as DIR—alter their date and large diplays to those of the coun-

You can make DOS believe it's in a different country simply by including a line in your CONFIG-SYS file. (This is explained in the chapter "Configuring Your System" in the DOS manual.) Of the supported countries, only good old Sweden uses the year-month-day format. So, your CON-FIG-SYS file could have the line

COUNTRY=046

The 046 is the code for Sweden. The numbers DOS uses are the international telephone system country codes.

Reboot with the CONFIG.SYS file in the root directory of your boot drive and do a DIR; it will look a little different, but the

■ PC TUTOR

IRM

date and time will be exactly the way you need to have them to run a sort by year, then by months and days. Now you can set un the batch file Tom Sheldon suggests with the line

DIR | SORT /+24

COMPAG

and you'll get a true date sort. One problem with this procedure is that vou may someday encounter an applications program that insists on using the Swedish kroner symbol instead of a dollar sign, since DOS continues to use country information you set with CONFIG.SYS and so believes it's in Sweden. If you'd rather not spend all your DOS days in Sweden, you can remove the COUNTRY line from your CONFIG.SYS file and use a couple of short programs to change the country as you wish. These programs will let you fly to Sweden and back again real quick. Figure 2 shows you how to use DE-BUG to make a SWEDEN.COM file. Figure 3 shows the USA.COM file. Your batch file would now look like this:

SWEDEN DIR | SORT /+24

USA

The value of the AL register in these programs is the same as the country code used in the CONFIG SYS COUNTRY statement but expressed in hexadecimal rather than decimal numbers.

THE V20 AND THE 8087

I have an IBM PC with an 8087 coprocessor chip installed. Will I get a further in-

Writing COSR bytes

Figure 2: This DEBUG session creates a SWEDEN.COM program. When it's run una PC-DOS 3.0 or 3.1, the date format used by

DOS will be in YY-MM-DD format and the time will use a 24-hour clock. UBA. COR



Figure 3: This DEBUG session creates a USA.COM program that tells PC-DOS 3.0 or 3.1 to display the dates and times in U.S. format.

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PC MAGAZINE . AUGUST 1986

crease in speed by substituting a NEC V20 chip for my 8088? The PC Magazitae article in Volume 4 Number 26 about the V20 ("Turbocharging your PC with the V-Series") did not mention anything about 8087 compatibility. Is the V20 compatible with the NSC.

John R. Day Cupertino, California

The NEC V20 processor is definitely compatible with the lutel 8087 math coprocessor. (It is sa compatible, in fact, that lutel is currently saing NEC for patent infringe-

■ While the V20 will boost the speed of much 8088 processor work, it will not significantly increase the speed of

calculations.

ment.) Bat while the V20 will boost the speed af mach 8088 processar work, it will not significantly increase the speed of floating-point calculations done by the

floating-point

ลกลา Far readers anfamiliar with these chips, here's a fast raudown: The 8087 is a floating-point math coprocessar chip that you can install in the empty socket next to the 8088 microprocessor on the system board of PCs, XTs, and many compatibles. (Exceptious are the PCjt, which has no empty socket, and the PC AT, which requires the 80287 math conrocessor chip instead of an 8087). Many statistical and math packages support an 8087, and other software is gradually coming around alsa. For instance, while 1-2-3, Release IA. cannot use an 8087, Release 2 checks to see if an 8087 has been installed and ases it

With tight and efficient 8087 code, the 8087 enables a pragram to do floatingpoint calculatious about 50 to 100 times

faster than equivalent assembly language rotatines. When using the Microsoft complex IC, FORTAN, Pascell) that support the 8807, you can expect floating-post acclusibles to go others 20 dines faster than the '8807 emulation' rotatines there complete have to use as more soften the other control of the control of the state of the

The 80287 chip installed in an AT does unt provide the same degree of improvement. To learn why, check out the special Fall 1985 issue of Byte, "Inside the IBM PCs," which last a very interesing article by MicroWay's Steve Fried on the complexities of measuring 8087 and 80287 nerformance.

The NEC V20 chip is a direct substitute for the lutel 8088 microprocessor in PCs and XTs. Just port the 8088 out and stick the V20 in. HI you've never practiced removing and installing integrated circuits-by stuffing the sockets on an unfilled memory-expansion board, for example-replacing a 40-pin microprocessor is probably not the place to start learning. Enlist the help of a more experienced friend or serviceman.-Ed. 1 The V20 provides a slightly enhanced instruction set (which PC software developers will probably ignore), corrects at least one 8088 bug, and, most important, executes many 8088 inachine-language instructious faster-particularly those that take longest on the 8088, such as multiply and divide, Overall, you'll probably get about a 5 to 10 percent processor speed improvement

10 perceut processor speed improvement with a V20. Nate, however, that you probably won't get significantly faster screen writ-

won't get significantly faster screen writing on a color/graphics display, since programs mast still wait for horizontal retrace before writing to the screen.

Users af The Notion Utilities should be skepited of the 1.8" performance index" that SYSINFO reports for the V2D. Norton's program involves looping around a couple of HULL and IDV instractions. These instructions are very slow in the 8088. Other micraprocessors (including the WEC V20, the 801868, and the 80286) will ran them much fuster. The SYSINFO index should always be interpreted as re-

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portine an upper limit rather than an averare measure of performance improvement

If floating-point calculations are your main concern, a V20 will not do much for

yon. Using the Microsoft C Compiler 3.00. I found that floating point calcidations done by the Microsoft emulation softwere without using an 8087 improve by about 15 percent when a V20 replaces the

8088. However, 8087 floating-point calculations with a V20 and 8087 are only about 2 percent faster than the 8088/8087 combination. Why is this? Simple: the emukation routines use a lot of multiply and divide instructions that are significantly improved by the V20. When the 8087 is used for floating-point calculations, these 8088 instructions don't have to be used as extensively. Hence, the speed improvement is neolioible.

Still, I have not yet heard about any problems with the V20 chip. Considering that it's very inexpensive (about \$25), it's probably worthwhile in any case to saueeze out an extra few percent of performance improvement from your PC or XT.

REVIEWS IN BRIEF

Turbo-Cool: Keeping Your PC from Overboiling

BY JIM FORNEY

After years of slaving over hot circuitry, my faithful, overloaded 1BM PC is running at least 15 degrees cooler these days thanks to an add-on cooling fan called Turbo-Cool from PC Cooling Systems. Turbo-Cool (formerly known as "Silencer, model HP") bolts onto the back of the PC over the power supply's exhaust grill, drawing up to 100 percent

more air through the unit Prior to installing the Turbo-Cool, I measured a 30-degree temperature rise above ambient room temperature with a temperature probe positioned just above the motherboard and tucked in between two expansion boards. With Turbo-Cool installed and the temperature probe in the same location, the temperature rise was cut exactly in half-a mere 15 degrees hotter than my room-and the top of the PC's cabinet was significantly cooler to the touch at the hottest point (just above the location of the probe). Although "Silencer"—the name under which it was originally marketed-was a misnomer, Turbo-Cool's fan is much quieter than IBM's built-in cooling fan. In fact, there is no significant increase in the noise level with Turbo-Cool running.

Installation couldn't be easier, as it does not require going inside your computer at all. To install Turbo-Cool on a PC or XT, all you have to do is remove four screws from the back panel that secure the power supply in place. Then you simply attach the fan unit by inserting the longer screws supplied with it back into the same holes. The Turbo-Cool unit is just 3 inches thick and adds that much to the depth of a PC when installed, but in terms of required clearance behind the CPU, it doesn't add much beyond what you would normally leave to prevent kinking all those connecting cables anyway

The fan is supplied with a "Y" power cable, one end of which plugs into the monitor outlet on the back of the computer so that Turbo-Cool turns on automatically when you start your system. The other end of the Y has a monitor receptacle similar to the one that the fan has taken, so none of the original functionality is lost.

I've overheated my computer mothan once, especially in hot weather. Heat can be a major problem and can cause all manner of strange things to happen, as well as shortening the lifespan of all those expensive plug-in boards and gizmos you've added to your system. This looks like it's about as slick a way to keep the bugs away on a hot night as any I've seen.



PC Cooling Systems Bonsall, CA 92003-0518 (619) 723-9513 Price: \$69.95 (PC or XT) \$79.95 (AT)

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THE V20 AND THE PCir

I was very interested in the article on NEC V-series microprocessor replacement chips, in PC Magazine Volume 4 Number 26 ("Turbocharging Your PC with the V-Scries'*). Nothing was mentioned about the PCir. however. Would the NEC V20 increase the speed of my ir? I know that the PCir has a soldered-in 8088, but I can solder and feel comfortable replacing it. Would it be worth the effort?

Alfred Bottner Baltimore, Maryland

No. Soldering in the V20 is the easy part. Removing the existing 40-pin 8088 would be murder without the right tools.

Although I said above that the 5 to 10 percent speed improvement provided by the NEC V20 is worth the cost of the chip, I based that conclusion only on results from benchmark programs that I saw on thy screen. I cannot otherwise perceive the speed improvement that a V20 is viving me. Without rmning the benchmark prograins, I would not be able to guess that a PC had a V20 instead of an 8088 just by nsing the machine. I would not attack a PCir system board with a soldering iron for a speed increase that I could not actually feel.

ASK THE PC TUTOR

The PC Tutor solves practical problems and explains points of general interest. To see your questions answered here, drop a line to PC Tutor, PC Magazine, One Park Avenue, New York, NY 10016,

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